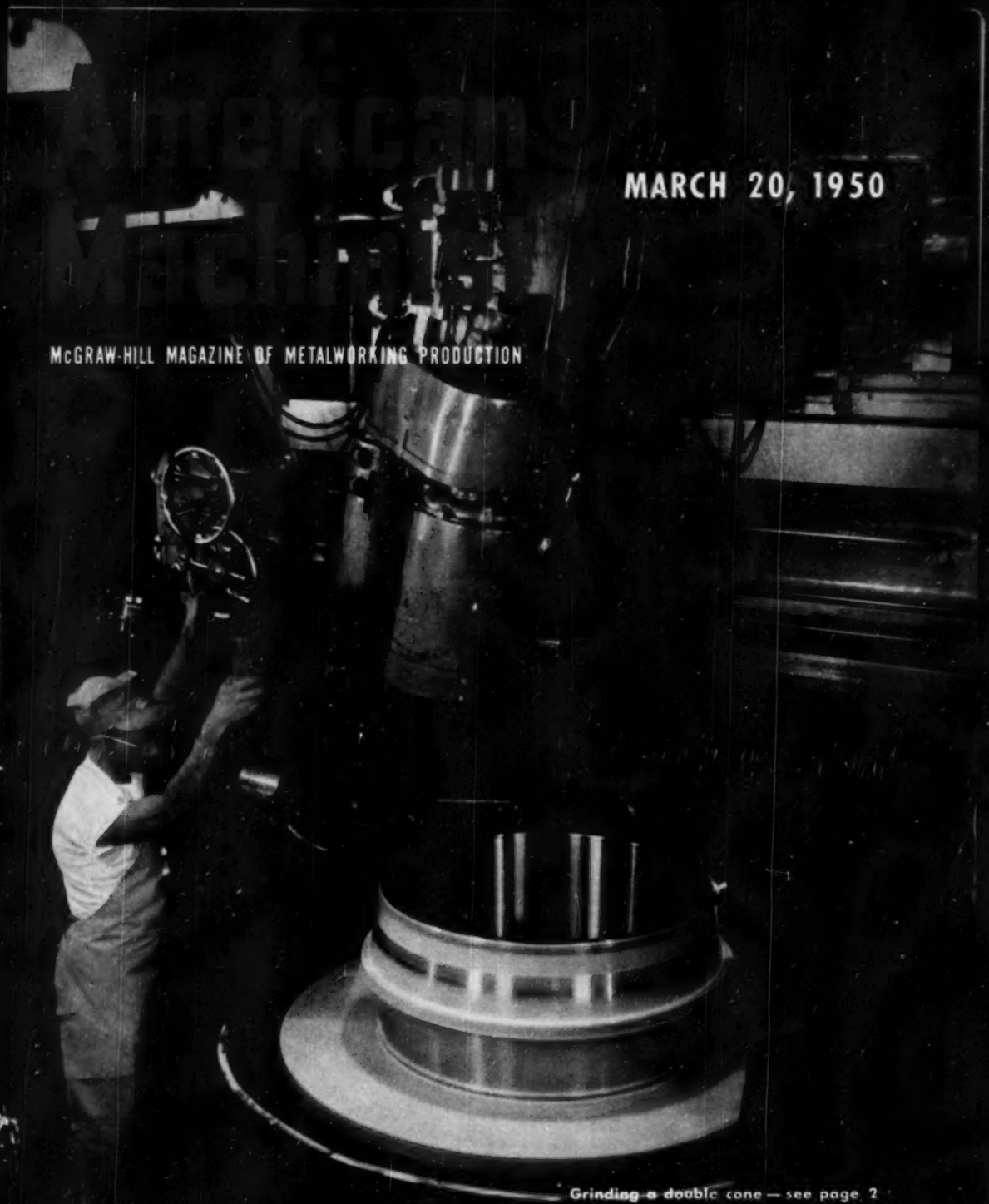
MARCH 20, 1950

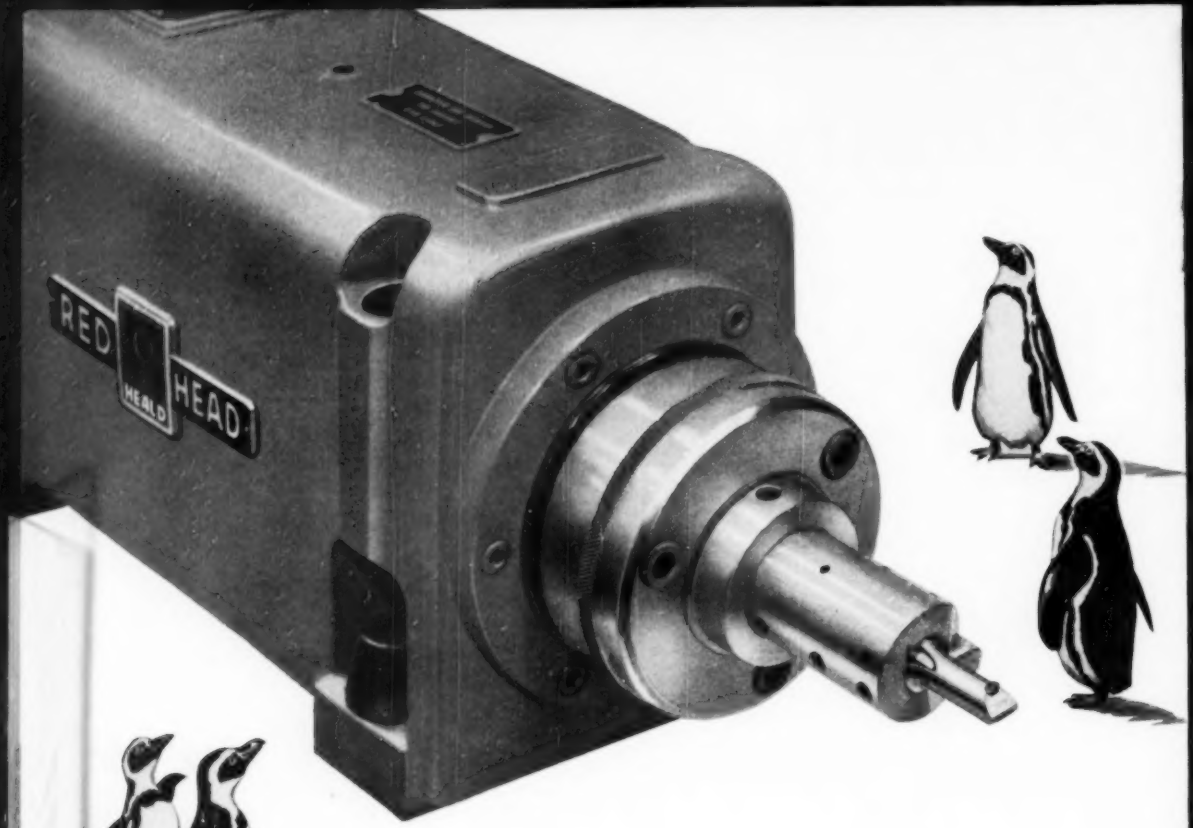
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Grinding a double cone — see page 2

Gear Finishing Equipment — A SPECIAL REPORT

Tank Fabrication... Foremen Help Cut Costs



fifty per cent cooler

for better accuracy — higher precision!

Accuracy-destroying heat has been left out in the cold. Not only in the design of the new Heald Red-Head boringheads and wheelheads, but in every other element of the Heald machines as well.

That, in part, is Heald's answer to today's urgent need for higher precision, greater accuracy, and faster, lower-cost production.

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American Machinist

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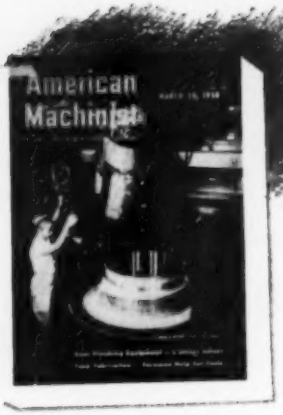


Chips and Quips

Special Grind . . . Our cover Kodachrome pictures a big race grinder at Timken Roller Bearing Co., Canton, O., made by Bullard; the machine is in effect a vertical boring mill with special grinding head. Here it is grinding the outer diameter of a double mill-bearing cone.

Gear Finishing . . . Charles G. Pfeffer, gear engineering consultant, began, over a year ago, a series of three Special Reports for us, detailing types of gear cutting, finishing and inspection equipment. The first Report, dealing with gear cutting, appeared in our issue of 1949. Here is the second, covering gear shaving, grinding, lapping and burnishing, as well as thread rolling, and showing latest equipment and its capacities.

Flat Ways . . . Harold A. Sizer, asst. to the director of design, Brown & Sharpe Mfg. Co., outlines two basic design steps as aids to the production and maintenance of flat horizontal surfaces in machine tools. The result of considerable study and research, this article will give you valuable tips on solving any problem of maintaining horizontal flatness.

Automatic Finishing . . . How do tractors get that showroom gloss? A. A. Stiehl, maintenance supt. of the Charles City, Ia., plant of The Oliver Corp., tells of his plant's new setup for mechanized finishing, in which De Vilbiss Company and Despatch Oven Company collaborated. It cut floor space, upped production 50%, cut maintenance costs 25% and gave better finishes.

Carbides on Screw Machines . . . Some months ago, we asked C. R. Morgan of the Screw Machine Section, General Electric Co., Pittsfield, Mass., to give us an outline of latest GE practice on screw machines. Mr. Morgan has just furnished an article covering his experience in how to train an organization to use carbide tooling effectively on automatics. Included are pointers on optimum motor power, chip removal, stock loading, proper lubrication, setup and resetting tools.

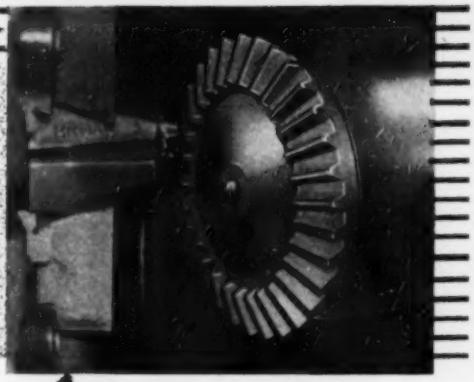
Tank Making . . . Several months ago, A. I. Nussbaum, Mond Nickel fellow from London, dropped in on his way home. He'd just finished a year's trek among American plants, was bubbling over with what he'd seen and heard. As we'd made some suggestions for his trip a year earlier, he reciprocated by offering us information on methods at C. F. Braun Co., Los Angeles. Here we bring you the methods in fabricating tanks and pressure vessels, including oxyacetylene sheet bevelers, plate rollers, automatic punch presses, hot spinning mill, special welders and advanced X ray. Later we'll present details of special handling units. We've used picture-and-caption treatment to speed your reading.

Tooling . . . Rupert Le Grand, during a recent visit to Detroit, picked up details of latest AC Spark Plug methods of tooling to simplify and speed second operations, such as turning, on die castings. He gives you major points in this issue. . . . There are also a group of Shop Shots, showing five new tooling tricks, including a wing fixture, dinking dies, overhaul fixture, chamfering oil holes, and buffing auto parts.

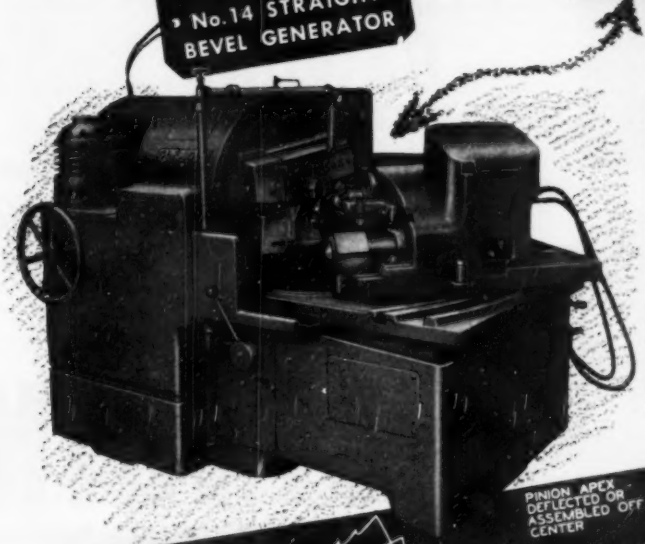
Coming . . . April 3 *AM* will be our Tool Show Number. The cover will be a very modern and interesting special painting in full color. Our Special Report will cover a modern press shop, and our general articles will feature tooling. There'll also be a list of exhibitors at the Show (Philadelphia, April 10-14), descriptions of new products to be shown there, and even a list of places to eat in and around the town. Among article subjects are: fabricating unusual parts for typewriters, form tools for multi-spindle machines, finishing of a big special molding die, boring a chamber with a swivel tool, special hob for V-grooves, horn dies, a broach that finishes a number of different parts, Talented Tooling ideas and our popular Short Cuts. There'll also be an article on apprentice training and several shorts.

MULTIPLE-SLIDE MAN . . . Otto Christian Held, project and production engineer, studied mechanical and electrical engineering at the Technische Lehranstalten in Offenbach, Germany, being graduated in 1926. Since his arrival in the United States, he has designed an automatic blast-furnace charger for Semet-Solvay Engrg. Co., a 3-generator powerplant extension for West Virginia Pulp & Paper Co., checked electrical layout for power plants for Ebasco Services, and done several jobs for Western Electric. He engineered production and inspection setups for radar gears, including high-production inspection units; set up a project to produce radio-telephone apparatus, including code signal selectors and mobile receivers; and engineered high-speed production of telephone-apparatus parts. During the latter period, he developed the methods and accessories described in the series of three articles, concluding in this issue, on multiple-slide machines.

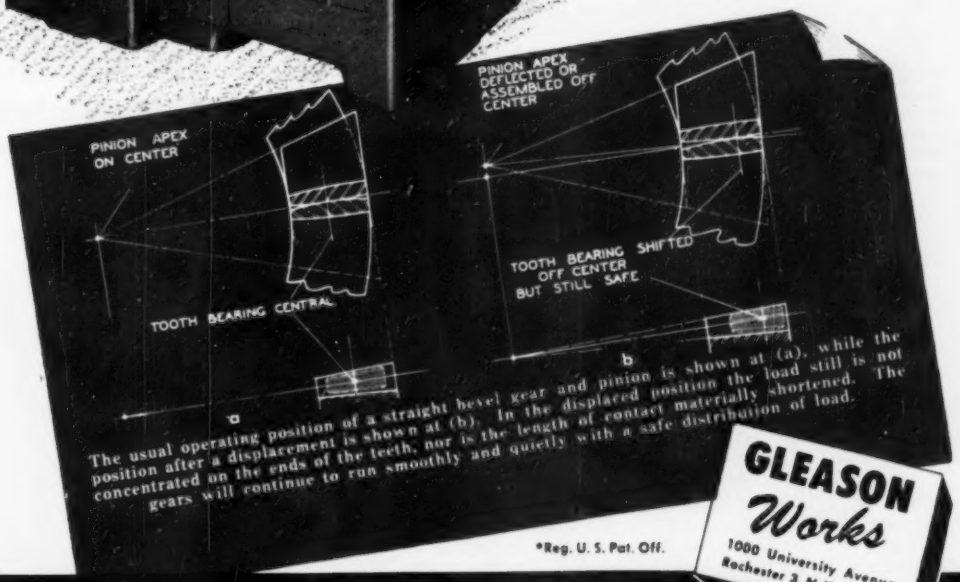
DESIGNED *Especially* FOR CONIFLEX GEAR PRODUCTION



GLEASON
No. 14 STRAIGHT BEVEL GENERATOR



Coniflex* gears, in the medium sizes, are produced on the Gleason No. 14 Straight Bevel Generator. Completely universal, this machine roughs and finishes Coniflex gears with equal versatility. The Gleason No. 14 Straight Bevel Generator is easier to operate and requires less cutting time than previous models for comparative gears. It also produces a localization of tooth bearing which makes Coniflex the smoother operating, easier assemblying gears with wider operating tolerances. Today, Coniflex gears have proven themselves superior to ordinary straight bevels. In saved assembly time, in superior operation, Coniflex gears are providing daily outstanding performance.

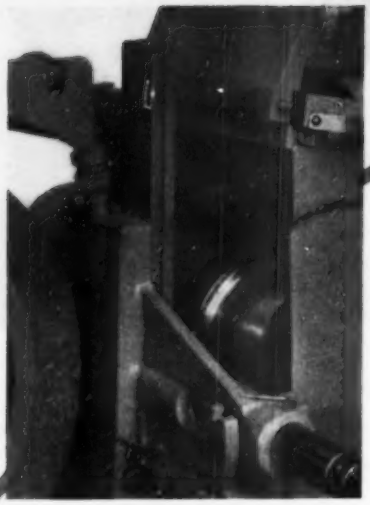

PINION APEX ON CENTER
TOOTH BEARING CENTRAL
a
PINION APEX DEFLECTED OR ASSEMBLED OFF CENTER
TOOTH BEARING SHIFTED OFF CENTER BUT STILL SAFE
b

The usual operating position of a straight bevel gear and pinion is shown at (a), while the position after a displacement is shown at (b). In the displaced position the load still is not concentrated on the ends of the teeth, nor is the length of contact materially shortened. The gears will continue to run smoothly and quietly with a safe distribution of load.

*Reg. U. S. Pat. Off.

GLEASON *Works*
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over Eighty Years



Entire length of tap blanks, including points, are ground at a production rate of 300 per hour, removing about .010" from all diams. Machine —new CINCINNATI FILMATIC No. 2 Centerless Grinder, equipped with magazine loading device.

FILMATIC

RANGE

Pin Point to Bowling Balls

... Centerless Ground at Lower Cost on New Cincinnati Filmatics

Some sizes of CINCINNATI FILMATIC Centerless Grinders are engaged in grinding hypodermic needles to almost a pin point in diameter. Others are engaged in grinding tap blanks, still others in grinding bowling balls to the close roundness and accuracy required for a clean strike. Whatever their "occupation," most centerless grinders have been producing at an exhausting rate of speed. Many are worn to the extent of urgent replacement; others are at the break-even point on the comparison sheet of defender vs. challenger. All of these machines can be profitably replaced now with new CINCINNATI FILMATIC Centerless Grinders. Considering the popular No. 2 size, for example, here are some of the reasons why:

a) FILMATIC grinding wheel spindle bearings; they outlast the machine and require no more than token attention.

b) Automatic lubrication, including the slideways; greatly extend the service life of the machine.

c) Swivel type regulating wheel unit; reduces set-up time.

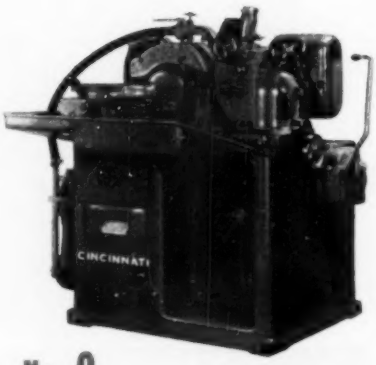
d) Wide variety of attachments and fixtures; for every centerless grinding operation, including some you might not suspect of centerless application.

Other advantages of CINCINNATI FILMATIC Centerless Grinders are outlined in literature. Write for copies. Then call in our Field Engineers who are ready to help you make your replacement analysis.

Cincinnati Grinders Incorporated, Cincinnati 9, Ohio.

CINCIN

CENTER TYPE GRINDING MACHINES
CENTERLESS GRINDING MACHINES



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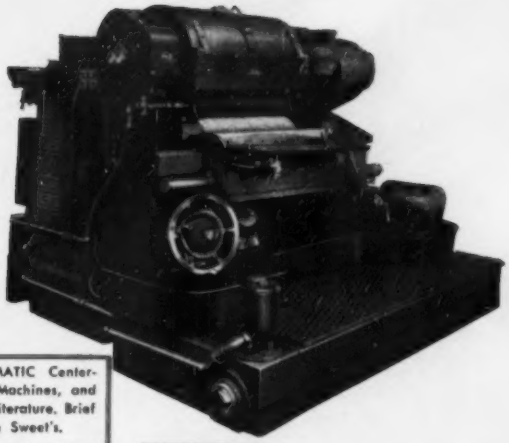
Bowling balls are ground to accurate roundness and size on a new CINCINNATI FILMATIC No. 4 Centerless Grinder equipped with automatic loading fixture. Production 22 per hour, removing about .025" stock.



CINCINNATI FILMATIC Centerless Grinding Machines, and corresponding literature. Brief specifications in Sweet's.

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No. 2: Publication No. G-591
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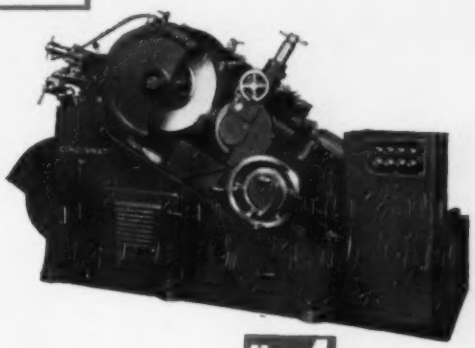

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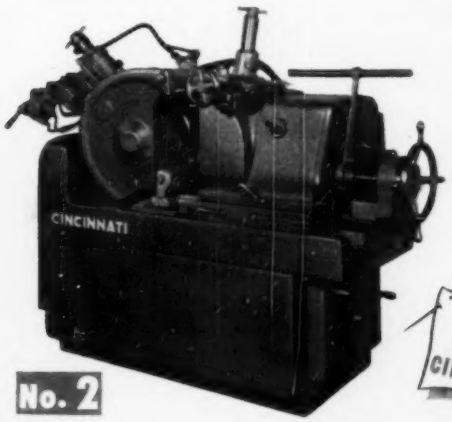
CINCINNATI

CENTERLESS LAPPING MACHINES
MICRO-CENTRIC GRINDING MACHINES



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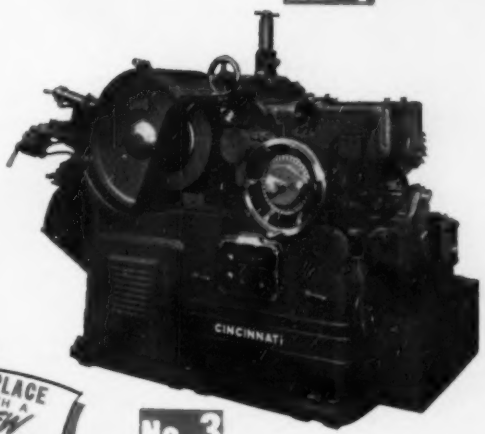
REPLACE WITH A NEW CINCINNATI



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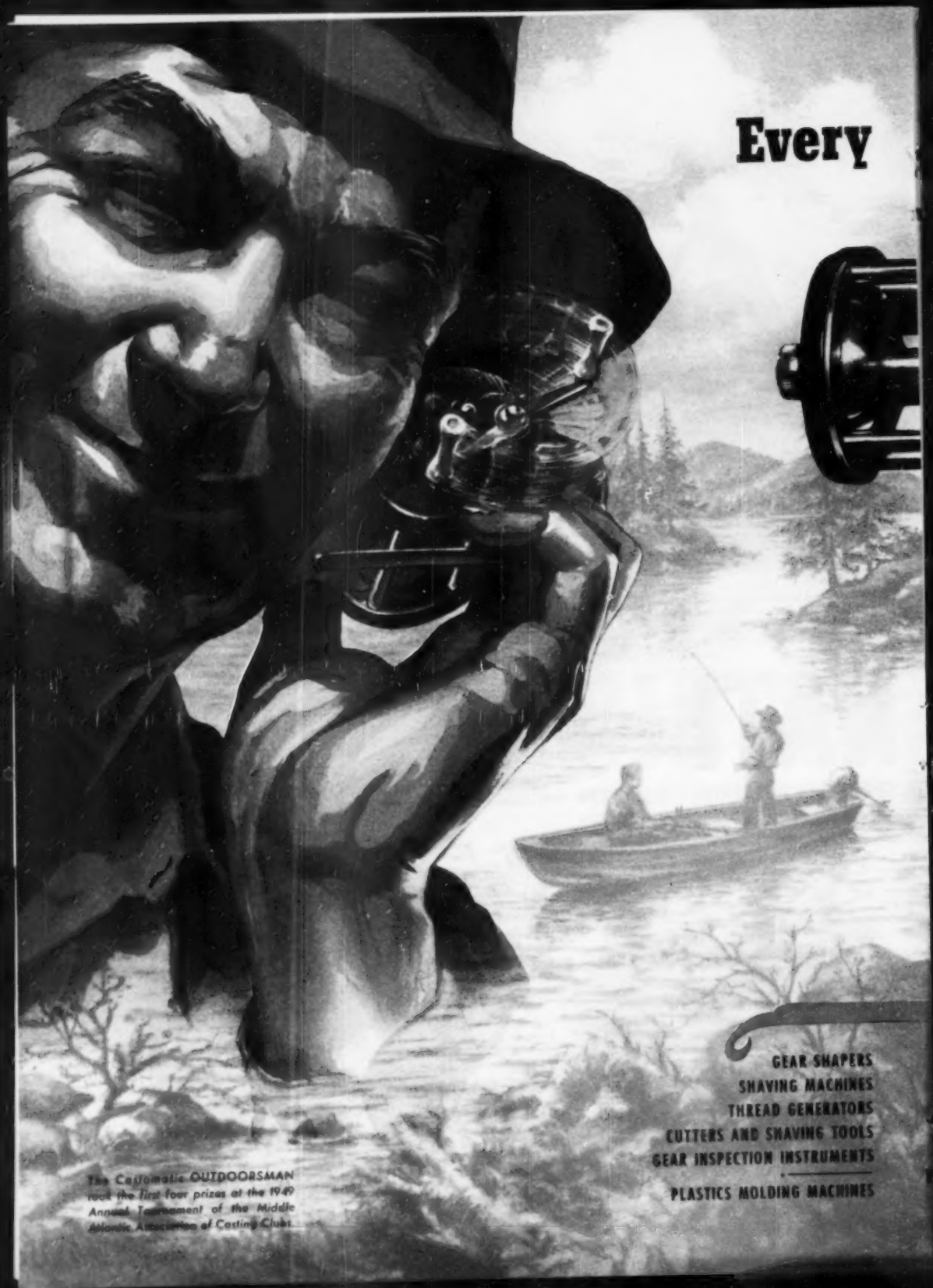
Every
GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES
The Castomatic OUTDOORSMAN took the first four prizes at the 1949 Annual Tournament of the Middle Atlantic Association of Casting Clubs

Outdoorsman's *a whispering*

Low Cost FELLOWS-Cut Gears Combine Superlative ACTION with Superlative QUIET...

The 3 inch Fine-Pitch Gear Shaper cuts this 9/32" face, 12-tooth 54 D.P., .220" P.D. pinion of SAE 1112 steel at 1200 strokes per min. The mating 5/32" face, 48-tooth gear of naval brass is cut at 2000 strokes per min. Time, floor to floor, is 35 and 45 seconds respectively.

In manufacturing gears for the popular-priced Castomatic OUTDOORSMAN, the Quaker City Gear Works, working with Fellows engineers, evolved a new 15° helix angle "quadruple multiplying" pair of gears—one steel, and the other brass. They are cut at cost-saving speed on the little Fine-Pitch Gear Shaper. Phenomenally quiet through the accuracy inherent in generated involutes, the action has ideal smoothness and freedom of spin. Better reels are in the offing, for all fishermen! . . . The same Fellows 3-Inch Fine-Pitch Gear Shaper has speed capacity (up to 2,000 strokes p. m.) to produce precision gears for any industry with eye-opening economy. Investigate—and cut better gears for less money!

This machine can be arranged with magazine attachment for automatic loading and unloading of stem pinions, ganged thin blanks, etc.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • **Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.**
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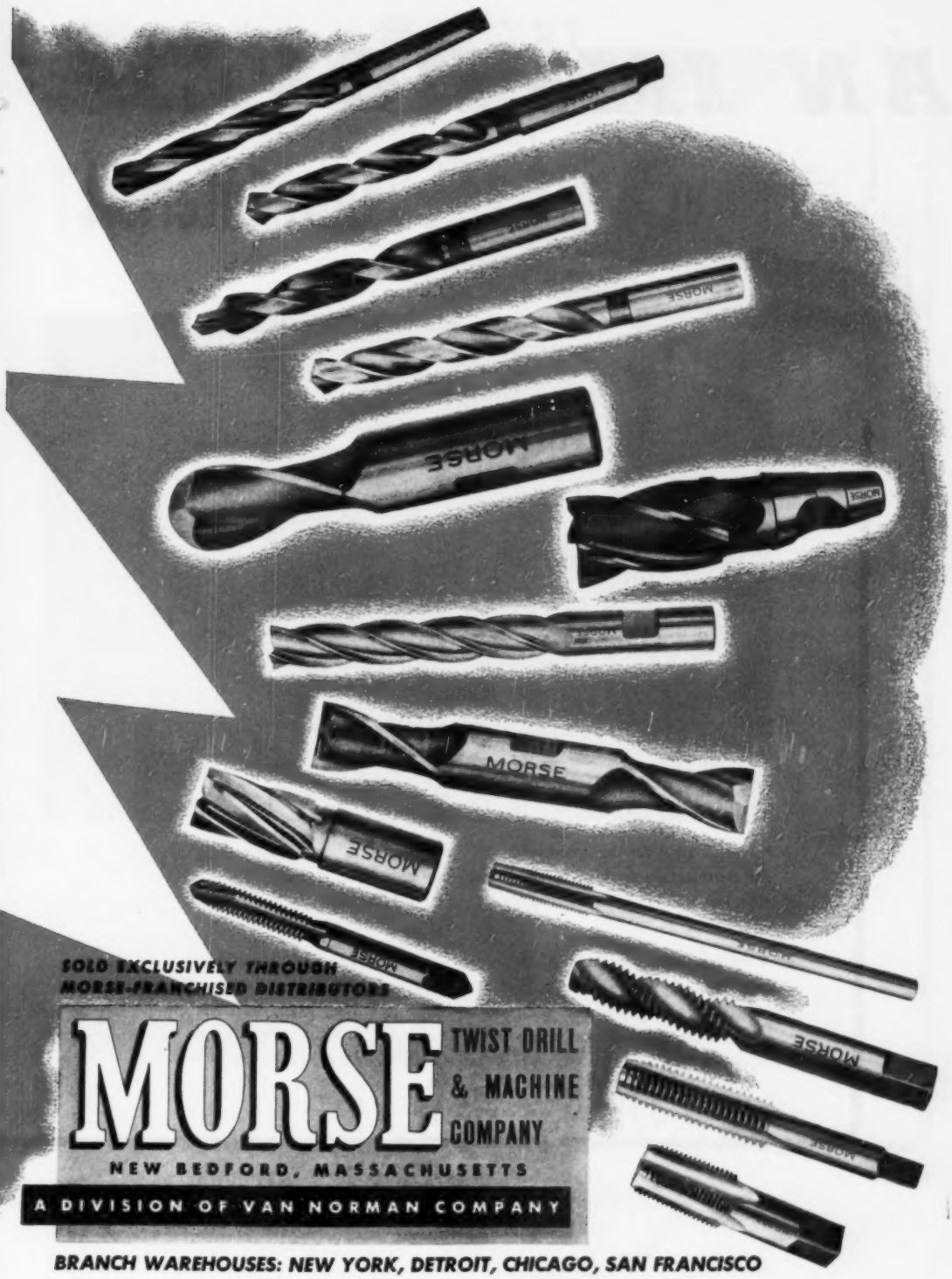

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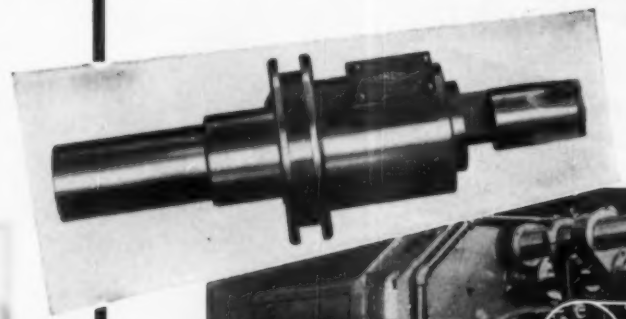
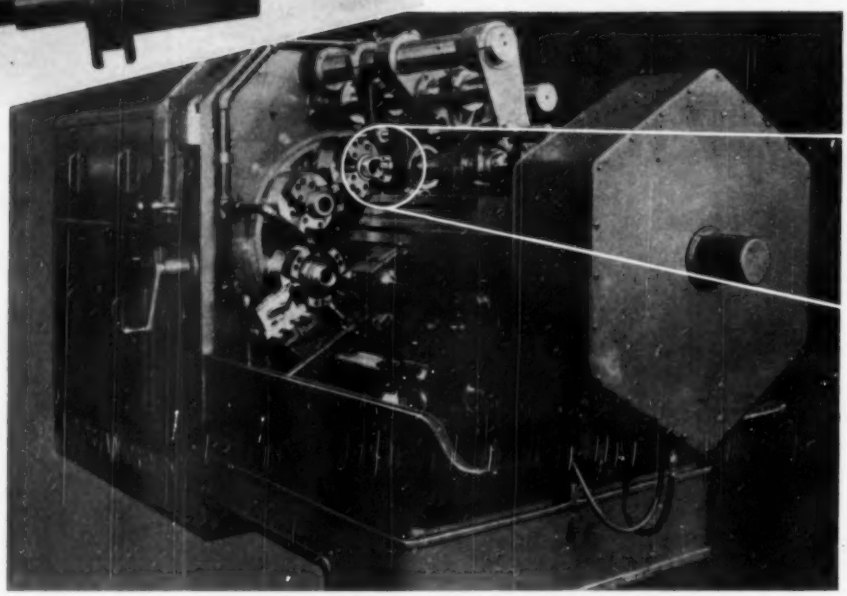
AN IMPROVED

Cuts Internal





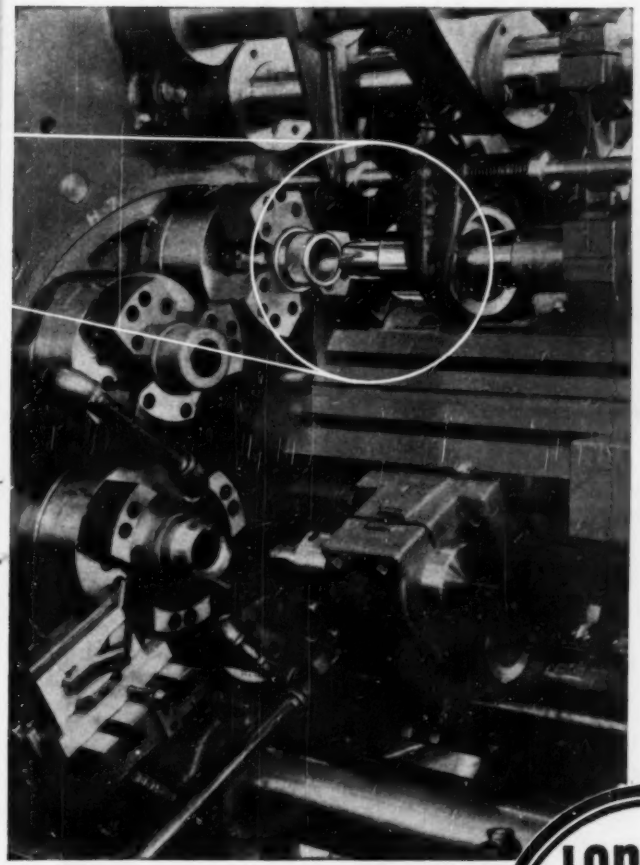
● The LL Taps are designed primarily for tapping tapered threads to A. P. I. standards. An outstanding feature is the detachable tap head permitting the use of various size tap heads to cover a wide range of thread sizes with a minimum amount of equipment.

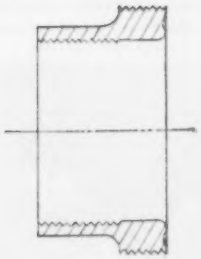
● In the improved Style ALM Heads, where an even number of chasers is used, no two chasers are directly opposite each other. This adds greater rigidity for the tap and permits the use of greater radial clearance, giving a freer cutting action with resulting increased chaser life. The Style LL Tap Body is made in four sizes to cover a range of nominal pipe sizes from 1" to 12", inclusive.

THE WORLD'S LARGEST MANUFACTURER OF

Landis TAP

Tapered Threads at 30 ft. per min.





• Using the new Landis Style LL Receding Chaser Collapsible Tap on an automatic screw machine, 2" 11½ pitch tapered pipe threads 1-5/16" long are tapped in quick change unions for oil field use at the rate of 30 feet per minute. The unions are cold worked forging 2⅜" in diameter of 185-220 Brinell hardness. The same piece is also made of malleable iron, and tapered threads are tapped at the rate of 120 feet per minute.

Write for Bulletin G-95

THREADING EQUIPMENT

LANDIS Machine COMPANY
WAYNESBORO PA., U.S.A.

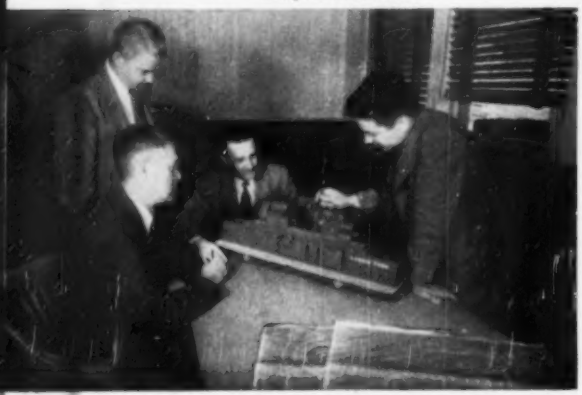
RESEARCH AND DEVELOPMENT—*Important reasons that keep LANDIS TOOL out ahead in grinding techniques and procedures today and tomorrow.*

LANDIS TOOL

Combines

*experience
modern plant
highly skilled workmen

...to offer you the



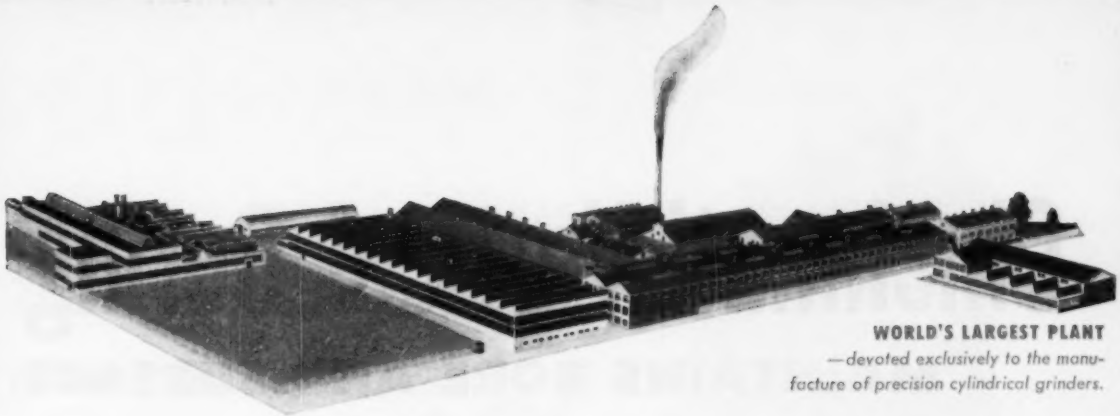
ADVANCED ENGINEERING PROGRAM —*New precision grinder designs studied by use of models. Experienced, practical and theoretical engineers make up this alert staff.*

PRECISION STARTS IN THE FOUNDRY—*A modern, well lighted foundry, rigid metallurgical specifications, stress relief by annealing castings in large furnace, provide a sound basis for machine precision.*

LANDIS TOOL

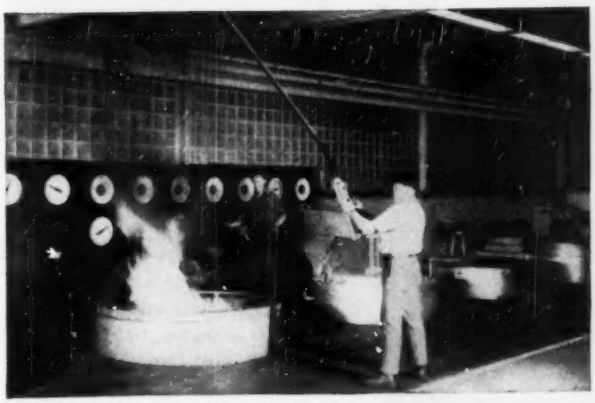
Precision Grinders

* *Since 1889 when Landis Brothers started to manufacture precision cylindrical grinders.* LANDIS TOOL COMPANY *formed in 1897.*



WORLD'S LARGEST PLANT
—devoted exclusively to the manufacture of precision cylindrical grinders.

finest precision cylindrical grinders



MODERN MANUFACTURING METHODS—*Clean working conditions and modern equipment assure uniformity of machine parts.*

● Modern Facilities

Precision is controlled at every step in production by facilities that are complete in our plant—engineering, foundry, pattern shop, machining, heat treating, plating, assembly, testing. Production equipment is the latest and finest—fully mechanized foundry, modern machine tools, instrument controlled heat treatment, finest of measuring and checking equipment.

● Craftsmanship Tradition

Skill and craftsmanship are needed to build precision grinders that will work to extremely close tolerances and finishes of 1 to 2 micro inches. LANDIS TOOL has the tradition of craftsmanship today with assurance of having it tomorrow—located in a small Pennsylvania Dutch community—60% of the employees with 10 years' service or more—a nationally recognized apprentice training program—father-son craftsmanship tradition in many families—wide employee stock ownership—local ownership and management.

● Engineering Leadership

A large, well manned engineering department, plus an active development laboratory, assures engineering leadership. Some of the many LANDIS TOOL grinding firsts are:—

flood cooling of work
hydraulic operation of wheel feed and traverse
long life, large diameter grinding wheels
controlled clearance Microsphere Bearing for wheel spindles
Centerless Thread Grinders

We invite you to visit . . .

and assure you a cordial welcome at the Landis Tool Company. From our methods and product you may gain time-saving ideas to put to work in your plant. Waynesboro is located in South Central Pennsylvania; only an overnight trip from any point east of the Mississippi. Company cars will be available to meet you at Harrisburg, Penna., Baltimore, Md., or Martinsburg, W. Va.

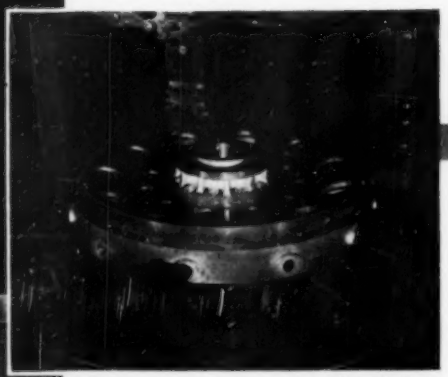
110

LANDIS TOOL COMPANY, WAYNESBORO, PENNA.

Cincinnati Vertical Boring

MAINTAINS BORE AND SURFACE

Two heads operate simultaneously to speed overall production time on this radial engine cover casting.



Close up view of cover under side. Multiple operations must be accurately completed to insure proper crankcase fits.

The way this job is handled . . .

First Setup

1. Rough counterbore 32" diam. 1/2" deep.
2. Rough Face casting top.
3. Rough out 9" diam. bore.
4. Bore light locating cut in bore.
5. Finish counterbore.
6. Finish top face.
7. Finish 32" diam. counterbore face.
8. Cut 3/8" diam. x 3/16" oil groove on top face.

MACHINE: 8' Cincinnati Vertical Boring and Turning Mill

TIME: Overall approximately 18 hours

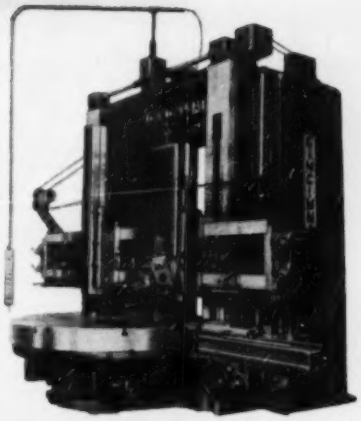
♦ PHOTOGRAPHS COURTESY NORDBERG MFG CO MILWAUKEE WIS

HYPRO

THE CINCINNATI

Subsidiary of Giddings & Lewis Machine

and Turning Mill RELATIONSHIPS within .001"



This standard Cincinnati HYPRO Vertical Boring and Turning Mill with two rail heads, and side head offers unusual machine possibilities on a broad range of work.

2 Rail Heads Operating Individually and Simultaneously Complete 16 Cutting Operations in 2 Setups on 58½" Diameter Radial Diesel Engine Crank Case Cover Casting

Second Setup

1. True to operation 4 first setup.
2. Rough turn 4 faces for crankcase fit.
3. Rough turns on 18-1/2" diam. inner flange and 54" outer flange.
4. Rough inner face for gear clearance.
5. Loosen workpiece and recheck to bore locating mark.
6. Follow above operations finishing to .001".
7. Finish 9" bore to .001".
8. Recess groove in 9" bore for oil.

CUTTERS: Kennametal
MATERIAL: Cast iron
SPEED: 25 R.P.M.

Holding accurate dimensional relationships on the job between bore center and flange face, as well as other machined casting surfaces becomes a simple matter when a Cincinnati HYPRO Vertical Boring and Turning Mill is used.

For example, sides of the 58½" diameter cover casting are machined in two settings. The first setup operations include in part: facing to insure proper casting clean up; rough boring, counterboring and grooving. In the second setup, turning, facing, and finish boring operations are completed. Independent feed and traverse is furnished to each head, which speeds overall machining time. In addition to reducing cutting time, use of the Cincinnati HYPRO solid narrow guide cross rail insures greater accuracy.

Relationship between the bore center and the flange periphery is easy to maintain, since the table is mounted on high precision roller bearings. Full machine control enables the operator to work either head on the rail to predetermined settings. This in turn reflects in the finished accuracy of the workpiece. All dimensions are readily held to .001" to meet inspection and crankcase assembly requirements.

Multiple Machining Operations For Important Component Fits

Boring, turning, chamfering, facing, counterboring, grooving, recessing are a few of the many machining operations economically performed on the Cincinnati HYPRO Vertical Boring and Turning Mill. Built-in machine accuracy combined with ease of control and greater flexibility makes it possible to machine a broad range of equipment components and parts. When this machine is used you are assured of precision fits in subsequent assembly operations. If you are now faced with troublesome machining jobs on large or unusual parts, our engineers will gladly consult with you and point out the advantages of using this vertical mill for your needs.

G&L PLANER COMPANY
Tool Company, FOND DU LAC, WISCONSIN, U.S.A.

For Peak Production use LINK-BELT SILENT CHAIN DRIVES

Easy to Select... Easy to Install... Immediate Delivery!

Full output at rated capacity demands power transmission without slippage—such as Link-Belt Silverstreak silent chain drives have always provided. Every r.p.m. is transmitted to the driven machine. Losses due to slippage are eliminated—output is increased. Yet Link-Belt Silverstreak silent chain possesses sufficient flexibility to absorb shock. Even on short centers it runs slack with minimum wear. Moisture, temperature, age or periods of idleness have no effect on these all-steel, precision-built drives, immediately available from stock in ½ to 50 h.p. sizes. Stock Drive book No. 2125-A speeds and simplifies the selection of chains and sprockets to provide the exact drive required for any application in this horsepower range. Send for a copy, at once.

LINK-BELT Silverstreak SILENT CHAIN DRIVES

4 New Features of LINK-BELT Pre-selected Stock Silent Chain Drives

1 TAPER-LOCK BUSHINGS
Easy on—easy off—no reboring necessary.

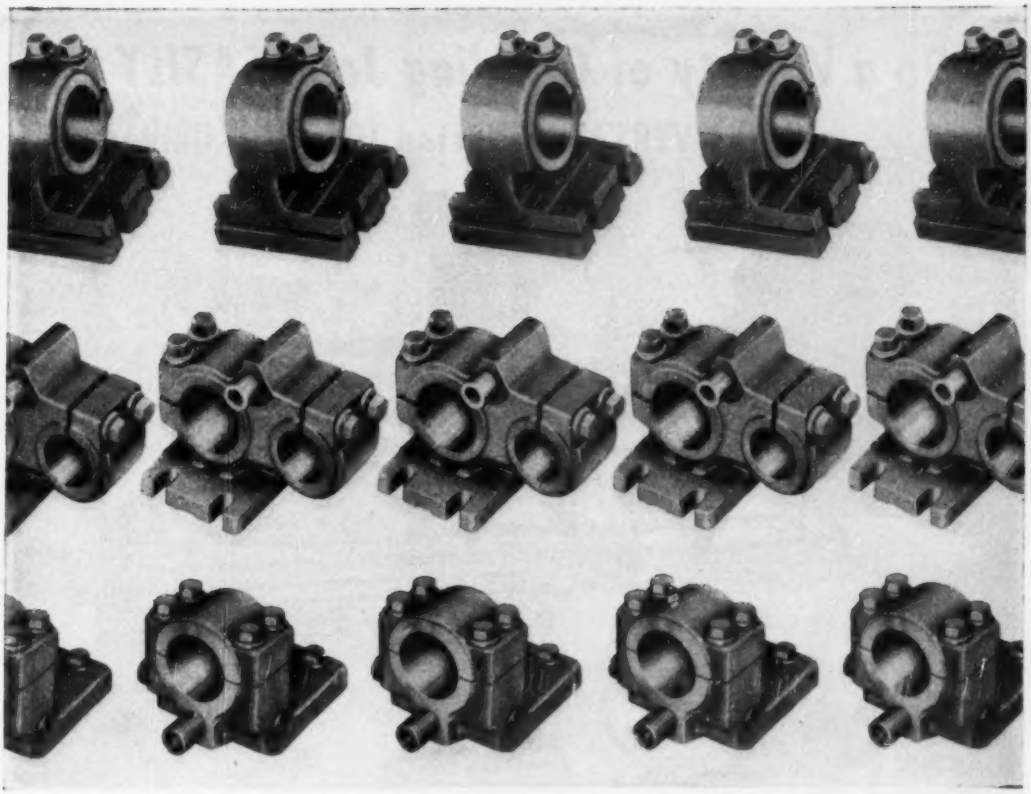
2 PINIONS-HARDENED TEETH
All-steel, with hardened teeth. Finished bores and keyways for N. E. M. A. motor shaft sizes.

3 INTERCHANGEABILITY
Link-Belt stock silent chain and Link-Belt stock silent chain sprockets are interchangeable with silent chain sprockets and silent chains cut to same tooth form.

4 EASY SELECTION
Easy-to-use selection tables cover ½ to 50 h.p. stock drives, tailored for normal operating conditions.

LINK-BELT COMPANY 11,500

Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities.



Tool holders for Warner & Swasey automatics fit *Any* position... *Any* machine!

Yes, all Warner & Swasey 5-Spindle Automatic End-Working Tool Holders are instantly interchangeable from position to position, and from machine to machine.

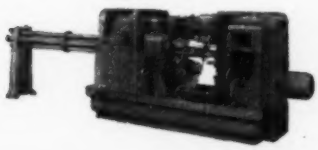
This *real advantage* is only possible because of the extreme precision built into the tools and machine, giving you full interchangeability with no sacrifice of alignment.

IT MEANS–

SMALLER TOOL INVENTORY . . . Fewer tools are needed for your battery of Warner & Swasey Automatics.

QUICKER SETUP . . . Your operator wastes no time hunting for the exact holder for one particular machine —one particular position.

GREATER FLEXIBILITY . . . You are not limited nor stopped by lack of a particular tool holder for its particular slide. *All* end working tool holders fit *all* positions on *all* Warner & Swasey Automatics.



This outstanding feature is but one of many reasons why you can cut costs with Warner & Swasey Multiple Spindle Automatics. Call the nearest Warner & Swasey Field Representative, or write Warner & Swasey, Cleveland, Ohio.

It's simpler to set up a Warner & Swasey CAMLESS Automatic!

WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

Do a Variety of Grinding Jobs EASILY

with the VERSATILE Norton 10 x 20" Universal

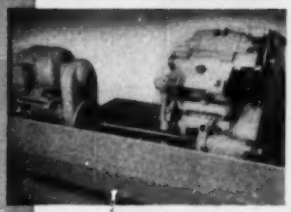
Outstanding versatility through new and different features—that's what you get in the Norton 10 x 20" Universal Grinder.

Certain of these features considerably lessen the set-up problems normally encountered with machines of earlier design. Others speed and ease operating and maintenance functions. All contribute to giving you lower total costs.

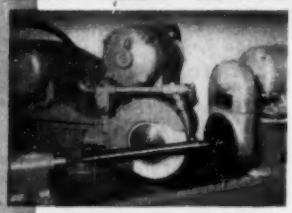
Catalog No. 170-2, supplied without obligation, graphically illustrates with pages of pictures the many convenience features and design highlights. →

CAM LOCK NOSE on this end of headstock spindle permits attachment of conventional or speed chucks in a matter of seconds.

COMPOUND WHEEL SLIDE design permits swivelling of wheel head to any angle and wheel feed at any angle.

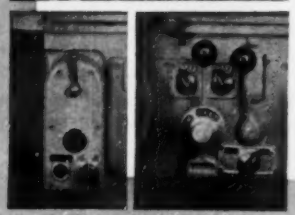


HINGED TYPE WATER GUARD extending full length of swivel table prevents objectionable spatter of coolant.



INTERCHANGEABLE HEAD and FOOTSTOCK greatly eases set-up problems encountered with many jobs.

HOLLOW SPINDLE in HEADSTOCK permits work up to 1″ in diameter and 30″ or longer to be passed clear through.



START, STOP, and WORK JOG CONTROL positioned for maximum convenience (left).
PRESET TRUING SPEED CONTROL eliminates need for disturbing table speed settings during truing.

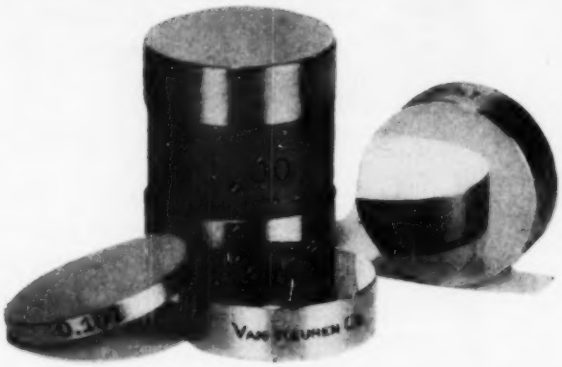
NORTON
GRINDERS and LAPPERS

M-584

Shop Set MTT . . . 35 blocks giving 140,000 combinations in ten thousandths. Price in mahogany case, $100.00.
Economy Set MT . . . Over 5000 combinations in thousandths. Price in mahogany case, $40.00.
Micrometer Set M21 . . . Includes 1", 2", 3", 4", 5" and 6" Micrometers. Price in mahogany case, $60.00.
Toolmakers Set M64 . . . Gives 121 combinations in 10ths, 32nds and 64ths. Price in mahogany case, $17.50.

The New Van Keuren

7/8" DIAMETER MICROGAGES are the best buy . . . . . .



60% More Wearing Surface . . . 25% Greater Accuracy . . . No increase in price.

A FOUNDATION FOR ACCURACY FOR 25 YEARS

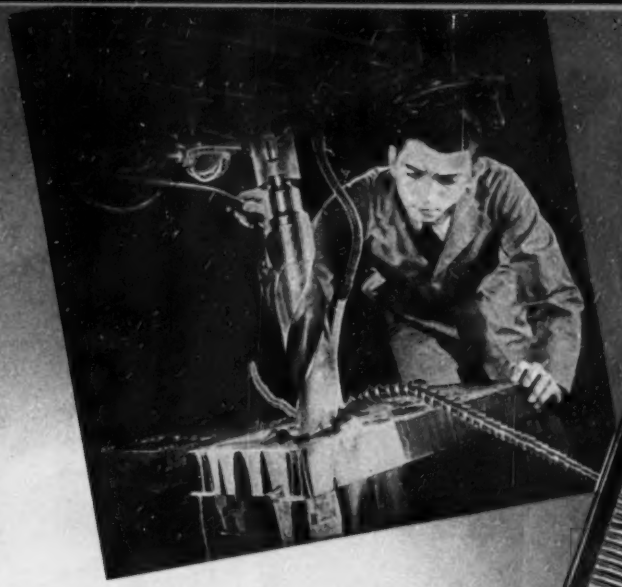
Van Keuren Microgages have been popular for over 25 years, because they provide a low cost means of securing accuracy in the shop, to meet the demands of the inspection department. The original Microgages were made 11/16" in diameter. The 7/8" body diameter of the NEW Microgages are ground true cylinders, and the end surfaces are held square with the body within close limits. This enables them to be easily aligned on machine ways for measuring carriage travel. The new Microgages have 40% more wearing surface than rectangular gages and they wring together tenaciously. The 7/8" diameter body provides excellent rigidity for the 6" long blocks.

Microgages up to 1" length are held within a tolerance of plus 12 millionths minus 8 millionths. They have an average wear allowance of 4 millionths oversize. They are available as individual gages from .0625" to 6" length, or in sets especially designed for general shop use, for tool setting and for tool makers and machinists.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

31st YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires



Adds Years of SERVICE...

Yes, the patented double low-hung spindle drive adds years of effective service to "AMERICAN" Hole Wizard Radial Drills—and in addition insures smooth holes and more holes per drill grind

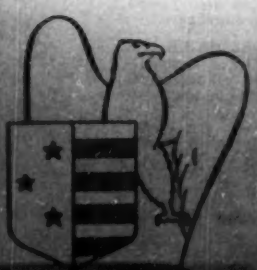
This patented spindle construction provides two drives—one through a large helical gear for the low-speed range and one through a smaller gear for the high-speed range This division of service between one large diameter and one smaller diameter gear results in low gear tooth pressures when performing large diameter drilling and boring operations through the low-speed range and low gear velocities when drilling at high speeds through the high-speed range. This is an ideal drive and unmistakably adds up to a longer and more effective life for the spindle transmission.

However, this is only part of the story. This drive is located at the bottom of the head as close as possible to the work, definitely reducing the torsional stress on the spindle, thus imparting a smooth action to it which in turn results in smooth, high quality work and prolongs the cutting edges of the tool.

The spindle itself is made of NITRALLOY steel as is also the spindle sleeve and both are nitrided for extreme surface hardness, the spindle being ground and the sleeve honed to very close limits. The spindle and sleeve are Timken mounted with an adjustment for wear This construction, combined with thorough lubrication by filtered oil, insures long life, maintained accuracy and low maintenance.

Cost-minded officials select "AMERICAN" Radials

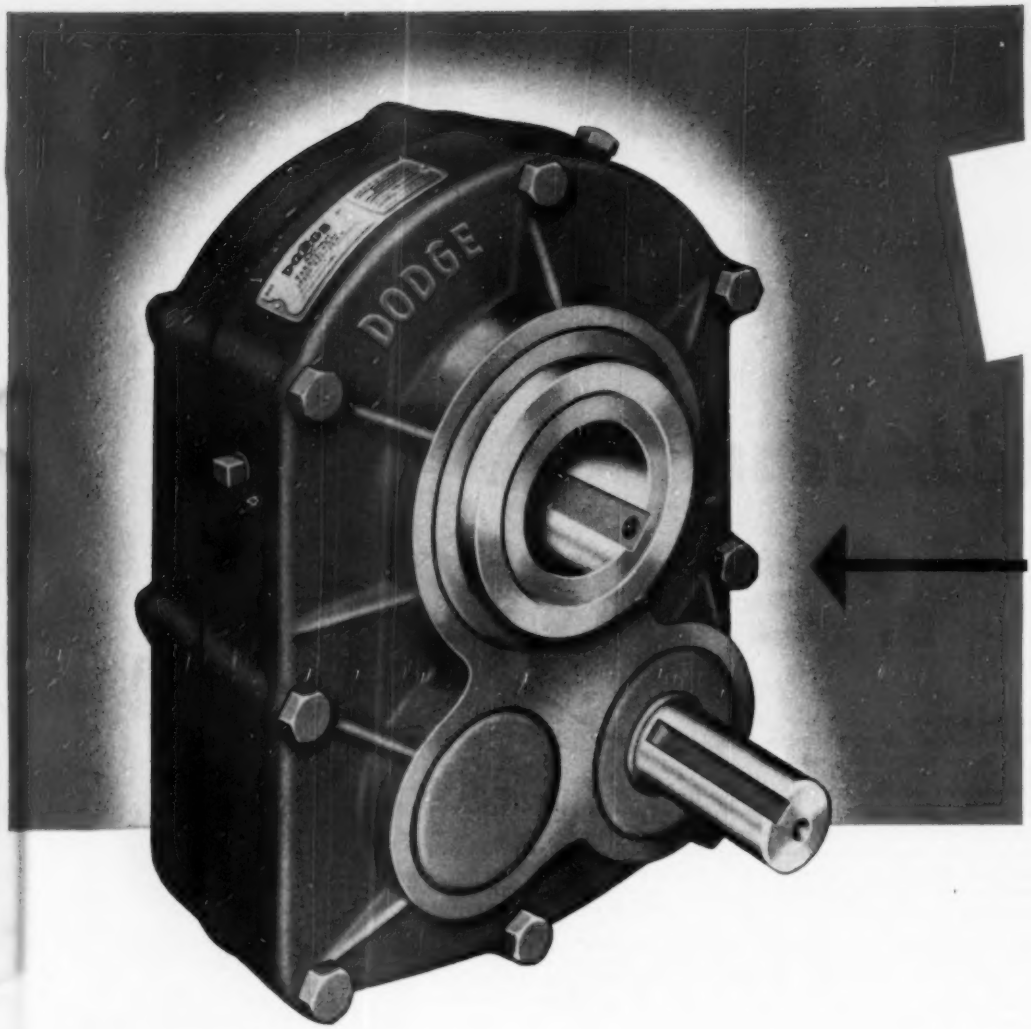
Will gladly send literature



THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills



- Available from *stock*, with stock-product economy. Built in six sizes with capacities up to 25 H. P. Develops any output speed from 13 to 133 R. P. M. through the use of stock TAPER-LOCK sheaves as prescribed for the job.
- No special engineering required. No foundation to provide. No flexible couplings. No sliding base. No "lining-up" difficulties. No expensive installation.
- Reducer locks on the shaft-to-be-driven with a steel locking collar on *each side* of unit.
- Unit is driven through any V-Belt Drive. This absorbs shock loads. Speeds can be varied by simple change of sheave. Interchangeable bushings adapt shaft sleeve to different shaft sizes, making application to other machines practical and easy.
- Torque arm, fastened to floor or any fixed object, anchors the reducer unit. Turnbuckle in torque arm provides fast and accurate adjustment of belt tension.
- Extremely compact, light. (Size No. 1 weighs only 35 pounds.) Extremely rugged. Cast iron housing. Double reduction train of helical steel gears. Shaved for *quiet* operation—heat treated for *long* life. Generous capacity deep groove ball bearings. Neoprene seals.
- Backstop available when required. Simple and positive. Easily installed on input shaft. Sealed from dust and dirt inside the reducer case.
- The TORQUE-ARM SPEED REDUCER is a *DODGE* product—which means *fine* engineering, *quality* manufacture. Get all the facts. *WRITE* for bulletin with selection tables.

NEW!

TORQUE-ARM SPEED REDUCER

SAVES MONEY!

The Dodge TORQUE-ARM SPEED REDUCER is a new tool for the mechanical transmission of power, so practical in design, so effective in operation, so low in cost, that it promises to benefit industry as extensively as the famous Dodge-Timken Bearing, the Dodge Rolling Grip Clutch, the Dodge Taper-Lock Sheave and other Dodge "firsts."

If you use conveyors of any kind, bucket elevators, agitators, mixers, feeders, processors or similar machinery—here is your opportunity to improve your drives, reduce maintenance and make substantial savings on equipment and installation.

See your local Dodge Distributor. Simply give him your horsepower requirement and the desired speed and size of the shaft to be driven. He will furnish you *from stock* this complete speed reducer package, to fit your job accurately, economically.

WRITE to us for Bulletin No. A470 with details, specifications and easy-to-use selection tables.

DODGE MANUFACTURING CORPORATION • 100 UNION STREET, MISHAWAKA, INDIANA

CALL THE TRANSMISSIONEER, your local Dodge Distributor, for information on new ways to improve machine performance, cut costs. Look for his name under "Power Transmission Equipment" in your classified telephone book.

DODGE

of Mishawaka, Ind.

FIRST IN POWER TRANSMISSION MACHINERY

LOOK TO THE HEADSTOCK
OF THE MODEL "C" LATHE
FOR PRECISION

12 inch • 14 inch • 16 inch

The P&W Model "C" Lathe is "The Standard By Which All Fine Lathes Are Judged." Remove the headstock cover and you'll sense one of the important "reasons why." Time-tested engineering, craftsmanship and precision are evident in every detail of this important gear train. Accurate to "tenths" in tooth form and spacing . . . finely finished for quietness . . . full anti-friction bearing mounting for smoothness — this outstanding headstock construction will have a far-reaching effect upon the precision, quality and economy of your toolroom output.

Spindle Speeds in Smooth, Geometrical Progression

Here, graphically, is the reason why the P&W Model "C" Lathe gives the right spindle speed for the job . . . 18 speeds arranged in geometrical progression. Every job can be run at full cutting efficiency because "next lower" or "next higher" speed is not a big jump — a real engineering accomplishment in modern lathe headstock design.

Write for Bulletin

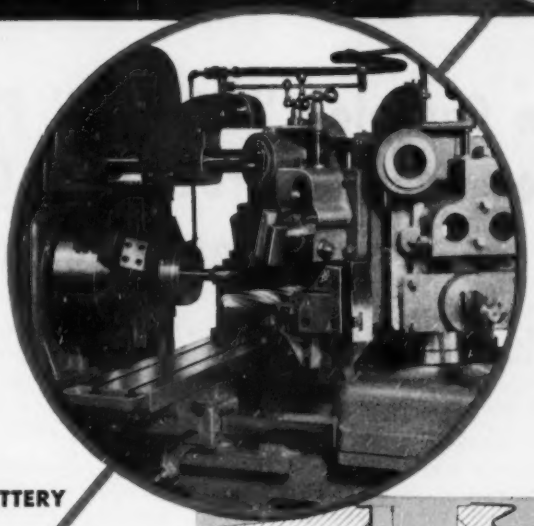
PRATT & WHITNEY
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

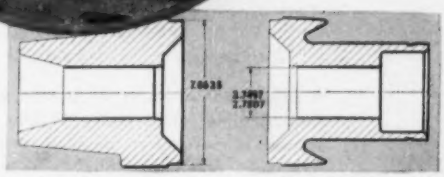
Model "C" LATHES
The standard by which all fine lathes are judged

You realize BIG *savings with*
POTTER & JOHNSTON TOOLING AND POTTER & JOHNSTON AUTOMATICS

because

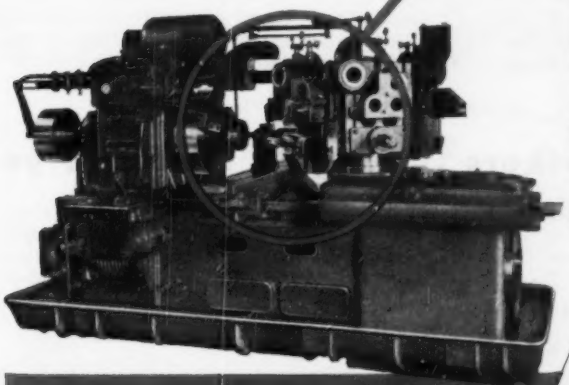
1. PRECISION OPERATIONS ARE FULLY AUTOMATIC
2. BETTER FINISHES ARE PRODUCED — *faster*
3. REJECTS ARE HELD TO A MINIMUM, AND
4. LABOR COSTS CAN BE DIVIDED BY USING A BATTERY OF P&J AUTOMATICS





1st OPERATION 2nd OPERATION

Typical of profitable high speed, precision machining is this P&J Tooling setup on the P&J 5DELX Automatic for mass-producing forged steel commutator spiders. The surfaces machined in 2 operations are indicated by the heavy lines in the drawings. To determine the savings possible on *your* work, send samples to P&J for tooling recommendations and time estimates — based on the experience-proved combination of P&J Tooling on P&J Automatics.



P&J 50 YEARS' EXPERIENCE IN TOOLING FOR
Precision + Productivity + Economy

POTTER & JOHNSTON CO.
PAWTUCKET, R. I.
subsidiary of PRATT & WHITNEY
Division Niles-Bement-Pond Company

If you have high Break-Even Point headaches...

The Carboloy "Triple C" Plan is the medicine you need! It provides a Quick and Positive way of lowering variable costs

EVEN UNDER today's conditions, it *is* possible to realize savings in variable costs . . . savings so substantial that the Break-Even Point can often be lowered.

Hard to believe? Well, Carboloy Company's unique "Triple C" Plan of Coordinated Carbide Control has helped countless manufacturers make such savings. Results speak for themselves. For example:

A large manufacturer of pumps cut machining time 40% under "Triple C". A second manufacturer doubled production and held down costs in spite of rising wages. Still another company reduced new tooling costs by one third.

Think of what savings like these can do toward lowering the crucial Break-Even Point!

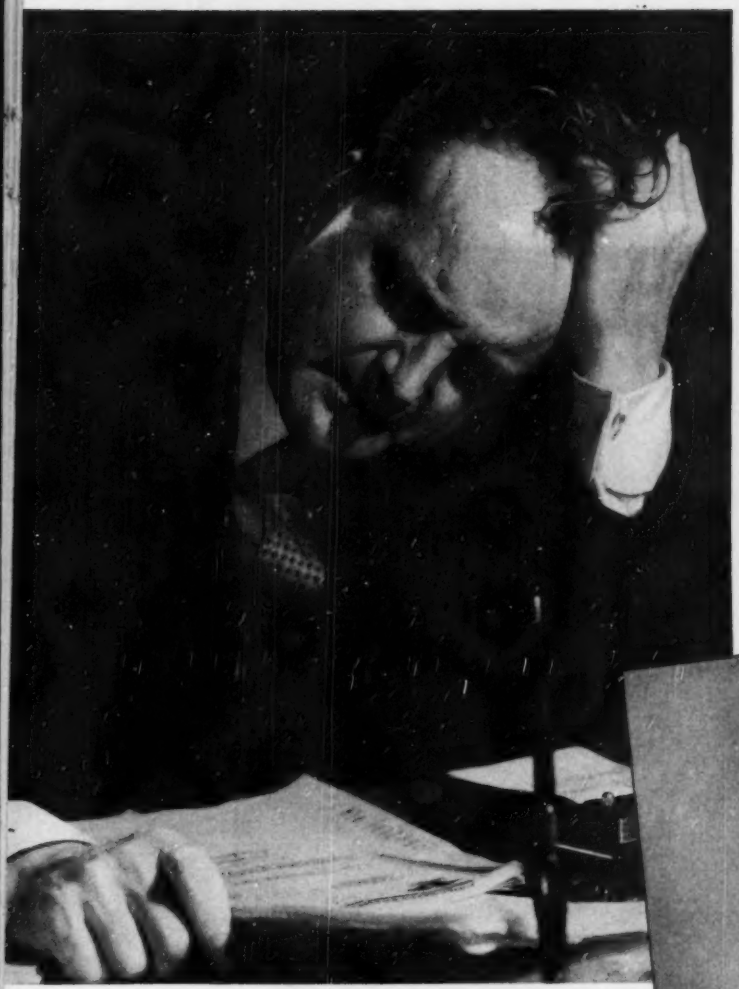
What is this "Triple C" Plan that works such miracles? It is a field-tested and proven plan for coordinating all phases of carbide tool design, application and maintenance in your plant through a system of centralized control. It is a program that touches every phase of operation and produces the kind of major savings that are reflected in the profit-or-loss statement.

It has worked for others . . . it can work for you!

The "Triple C" Plan has performed sensationally for major companies in *reducing costs, increasing production, eliminating waste.* It can work as effectively for your company. The CCC Plan Book, specially prepared for savings-minded management executives, tells the story. Why not send in the coupon for your complimentary copy today? There is no cost, no obligation. Carboloy Company, Inc., Detroit 32, Mich.

Visit Carboloy booth No. 736 at the A.S.T.E. Show.

CARBOLOY®



THIS BOOK TELLS HOW "TRIPLE C" CAN WORK FOR YOU

SEND FOR YOUR CCC PLAN BOOK TODAY—

CARBOLOY COMPANY, INC.,
11149 E. 8 Mile Road, Detroit 32, Michigan

Dear Sirs:

We want to know more about the Carboloy "Triple C" Plan to help lower our Break-Even Point. Without obligation, send us a copy of your CCC Plan Book for management and supervisory executives.

Name _____ Title _____

Company _____

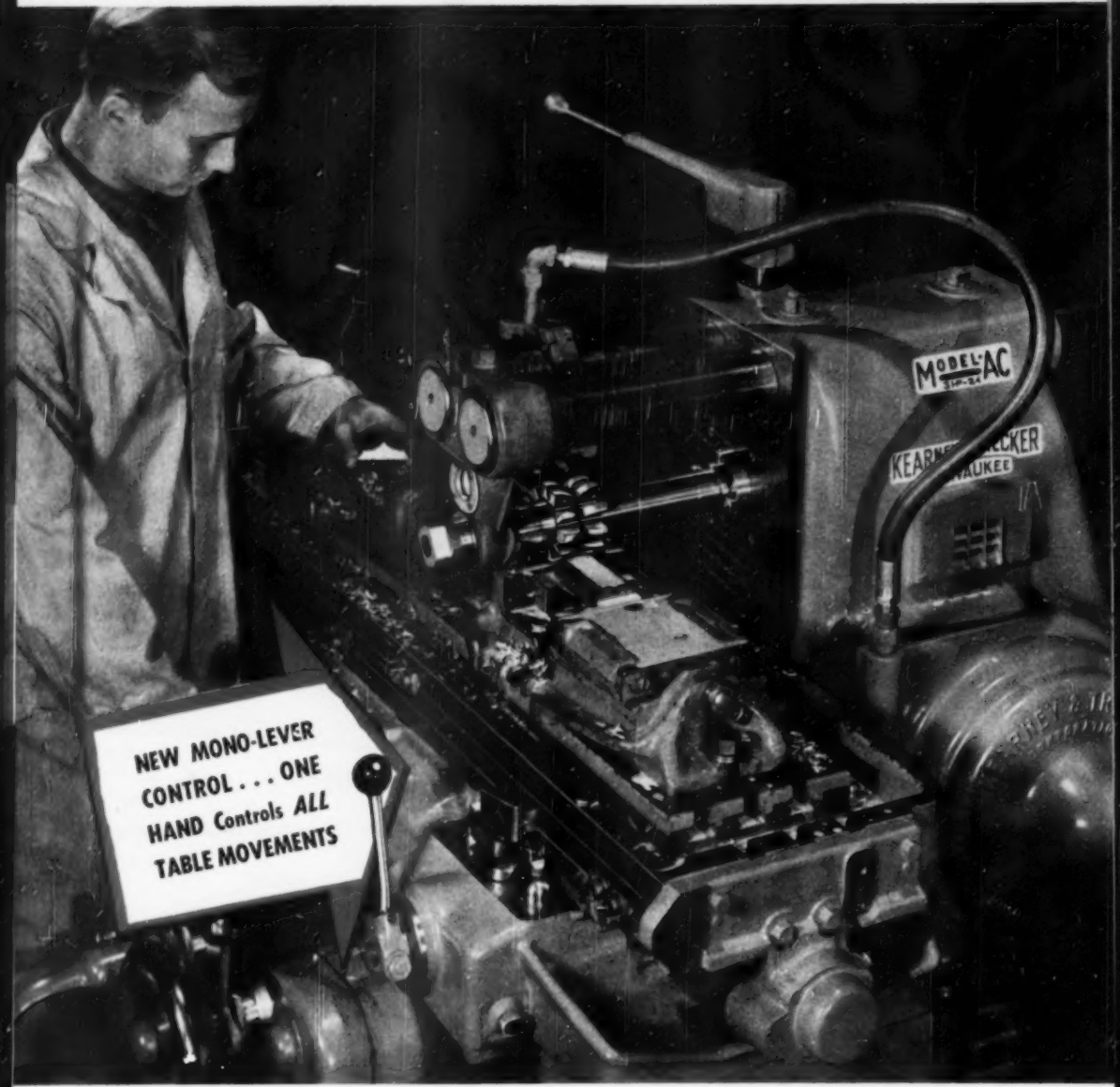
Address _____

City _____ Zone _____ State _____

THE CARBOLOY TRIPLE C PLAN
COORDINATED CARBIDE CONTROL
FOR EVEN GREATER SAVINGS WITH CARBIDES

CEMENTED CARBIDE

The Story's Always the Same..MONO-CUT MILLING COSTS



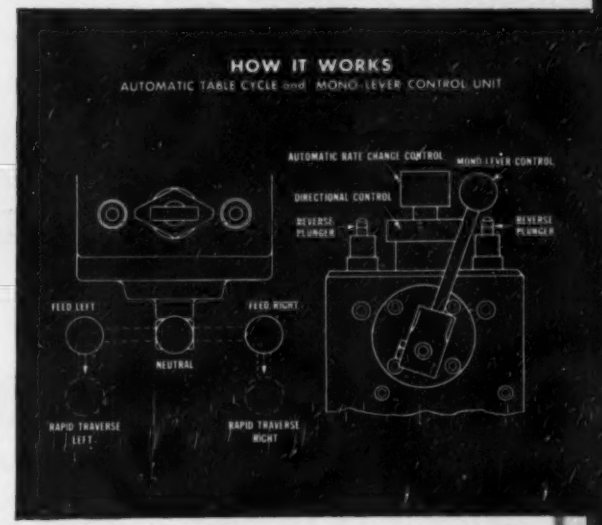
Camera study of good management at work! The job — form mill two radii on medium steel wedge plates. Fine finish required. With new Kearney & Trecker 3hp Model 24-AC machine, operator sets up automatic table cycle for reciprocal milling and easily paces production using climb and conventional milling alternately. **RESULT:** 28% savings in loading time, reduced scrap, more uniformity, less operator fatigue.

LEVER CONTROL DOES ALL ALONG THE LINE

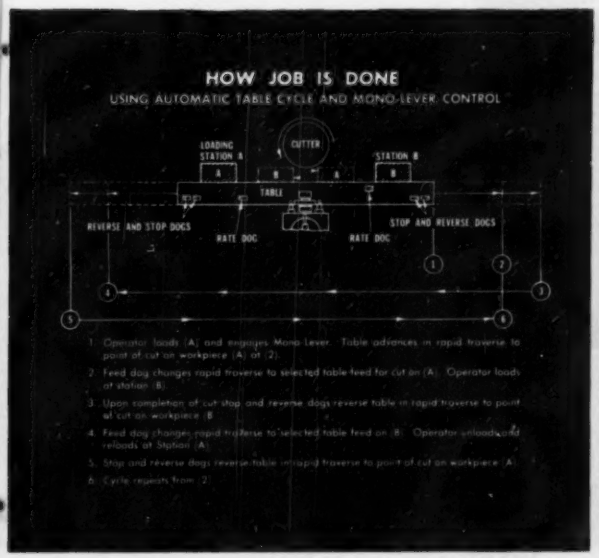
YES — if you investigate how a new Kearney & Trecker Knee-Type Milling Machine with Mono-Lever Table Control will perform in your shop — you'll see a really new story on increased profits and lowered costs on nearly every milling job.

Plant after plant has made similar investigations. The story is always the same — *cycle time reduced 16% to 31% — less operator fatigue — production increases ranging up to 96%!* No wonder shops everywhere are buying these machines with Mono-Lever Control.

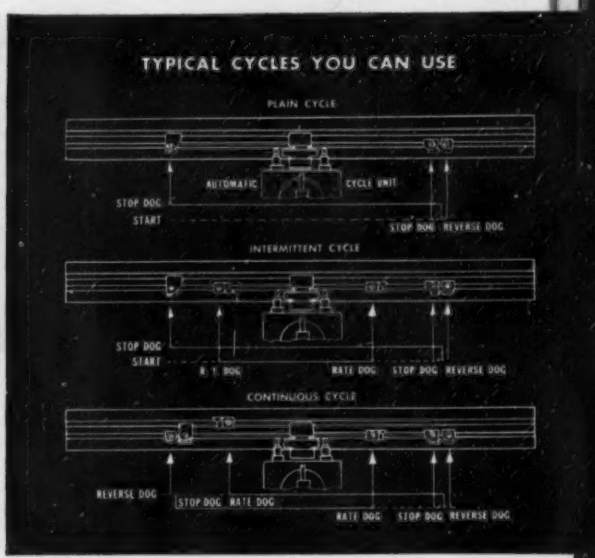
Contact us or our nearest representative today. Get proven facts on how Kearney & Trecker Milling Machines with Mono-Lever Control can cut your costs — increase your savings. No obligation. Kearney & Trecker Corporation, 6784 West National Avenue, Milwaukee 14, Wisconsin.



THINK OF IT! Now you can have all the advantages of this great cost-cutting feature plus the all-around versatility of general purpose, knee-type machines ... faster, easier control for greater production with less operator fatigue.


HOW JOB IS DONE
USING AUTOMATIC TABLE CYCLE AND MONO-LEVER CONTROL
LOADING STATION A
CUTTER
STATION B
TABLE
REVERSE AND STOP DOGS
RATE DOG
RATE DOG
STOP AND REVERSE DOGS
1. Operator loads (A) and engages Mono-Lever. Table advances in rapid traverse to point of cut on workpiece (A) at (2).
2. Feed dog changes rapid traverse to selected table feed for cut on (A). Operator loads at station (B).
3. Upon completion of cut stop and reverse dogs reverse table in rapid traverse to point of cut on workpiece (B).
4. Feed dog changes rapid traverse to selected table feed on (B). Operator unloads and reloads at Station (A).
5. Stop and reverse dogs reverse table in rapid traverse to point of cut on workpiece (A).
6. Cycle repeats from (2).

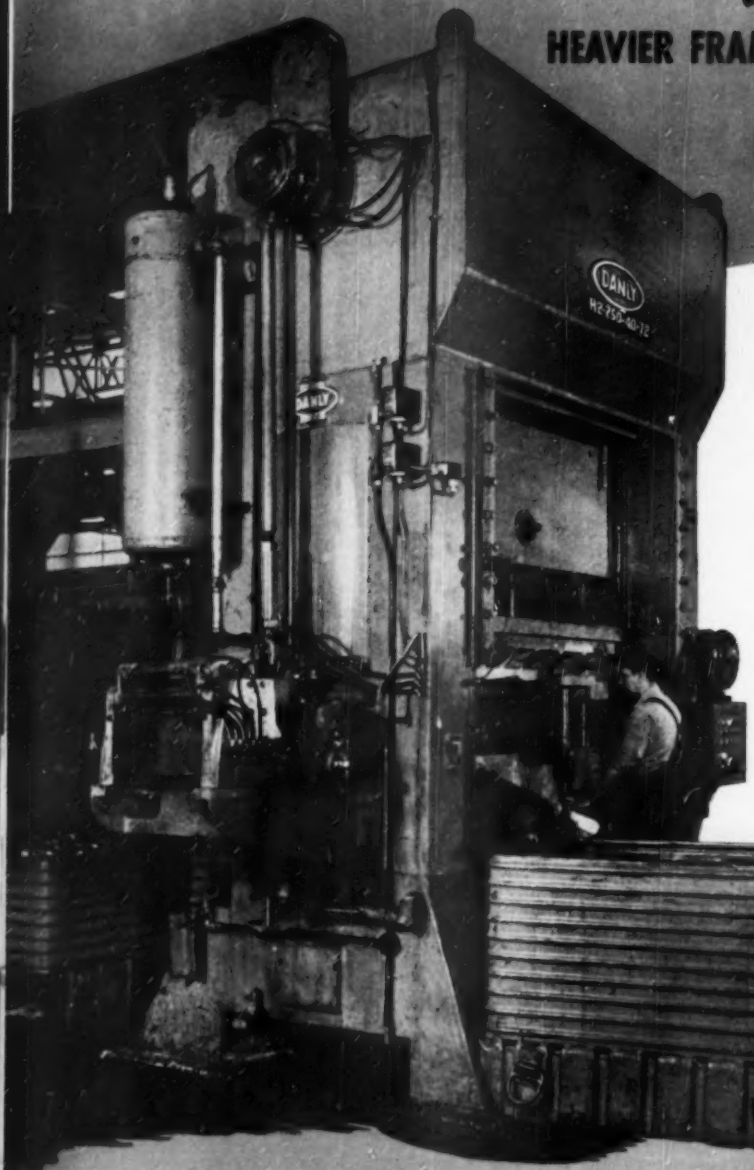
LOOK AT THE JOB at left — the diagram tells how it's done. Table feed screw with adjustable nut eliminates backlash, so climb and conventional cuts are taken with equal ease. Cycle pre-set to fit operator's required load and unload time.

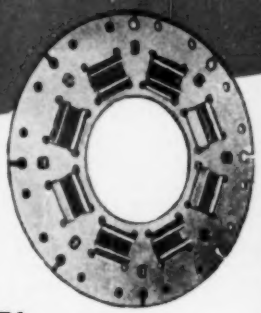


THREE DIFFERENT TYPICAL CYCLES to accommodate various job set-ups. Using automatic table cycle effects savings up to 31% for lots of 10 or more pieces. Cycle can be set for loading and unloading time — and reversed in feed or rapid traverse.

FASTER SPEED OF *Autofeed* PRESS

HEAVIER FRAME CONSTRUCTION





JOB DATA:

PRESS—Danly 250-ton Heavy Duty *Autofeed*

PART NAME—Clutch driven plate

DIE—4-stage progressive

STOCK—1020 CRS, 6⅛" wide x .076" thick, coil..

OPERATIONS—Blank, pierce and form complete. (No subsequent burring operation required)

This Danly 250-ton Heavy Duty Autofeed press produces both finished stampings shown on the inspection table (opposite page). Formerly, each stamping was made on a separate press.

DANLY®

DANLY MACHINE SPECIALTIES, INC.
2100 S. 52nd AVENUE, CHICAGO 50, ILLINOIS

MECHANICAL PRESSES

INCREASES PRODUCTION...TRIPLES DIE LIFE

REDUCES VIBRATION AND BED DEFLECTION

PERMITTING LONG RUNS AT HIGHER SPEED

THIS AUTOMOTIVE stamping was formerly produced on a press of the same tonnage at 20 strokes per minute. Now, on a Danly Heavy Duty *Autofeed* press, the speed has been tripled to 60 strokes per minute. In addition to increasing production, three times as many parts are produced between die grinds, and burring has been substantially reduced. Quality has been improved while reducing direct production costs.

All Heavy Duty *Autofeed* presses are designed throughout for faster, automatic stamping of parts. The entire frame is constructed heavier for the rated capacity of the press, reducing vibration at higher operating speeds. The result is longer uninterrupted runs, better die performance and higher product quality.

EXCLUSIVE DANLY FEATURES POINT TO LOWER STAMPING COSTS

Die Tryouts Facilitated—Special Danly controls and unusual clutch sensitivity inherent in Danly design permit closer, more accurate "inching" during die tryouts. This saves time and adds safety in getting dies spotted and in production.

Production Increased—Heavier frame construction permits taking full advantage of automatic feed through progressive dies completing numerous operations in one press. Handling is reduced—one press does the work of several presses.

Maintenance Costs Reduced—The Danly air-cooled, air-operated clutch and brake operate for prolonged periods without maintenance. Friction discs responsible for clutching and braking action are not subjected to the disintegrating effects of high temperatures.

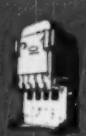
Automatic lubrication flushes all bearings in crown and slide, including gibs, substantially increasing the prime life and top performance of the press.

Inspection operation showing both clutch plates and lamp mounting brackets in place on gages. These parts are alternately produced on the Danly Autofeed Press.

WRITE FOR COMPLETE INFORMATION

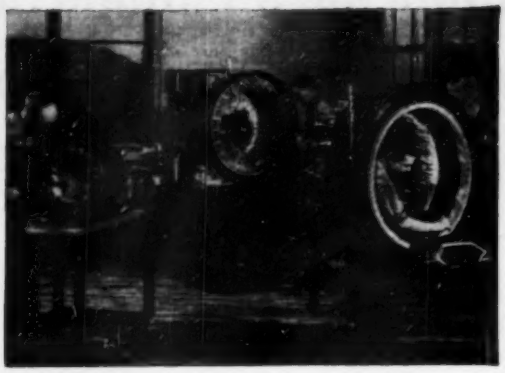
Consult Danly Engineers for the most efficient presses to meet any requirement from 50 tons up. Danly Straight-Side, Single Action, Double Action and Gap Frame Presses are also setting production records throughout industry today.

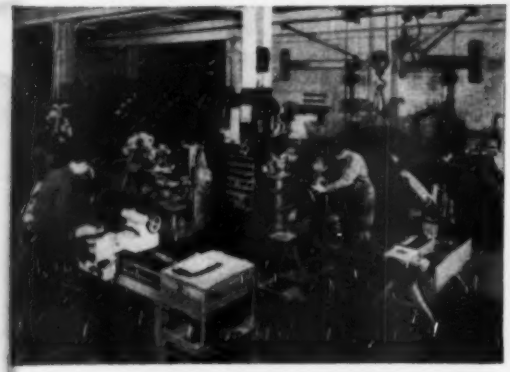
Write now for catalog on Danly presses which can lead to real cost savings in your press shop.

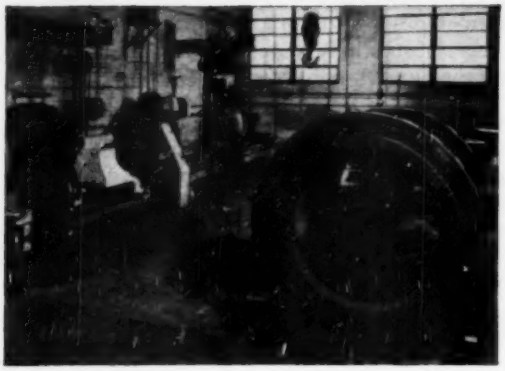


AND PRESS EQUIPMENT

OVER 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY







For Any Size Motors

DEPEND ON REPAIR SERVICE LIKE THIS!

Example: a Midwest Utility recently burned out a vital 75 hp motor. They called Chicago Electric, their nearby A-C Certified Service Shop, at 11:00 a.m. At 4:00 p.m. the same day, Chicago Electric had the unit repaired and back in service! Total time: 5 hours.

WHEREVER YOU ARE, you can get quick, dependable service from your nearby A-C Certified Service Shop, for there are over 75 such shops in all major industrial areas.

These shops have been selected on the basis of, **1)** quality of their work, **2)** facilities, and **3)** their community reputation. They maintain experienced personnel and use factory parts or parts of equal quality. They can be relied on for good work at honest prices.

When you need this kind of repair service on motors, controls or transformers, call your nearest Allis-Chalmers Certified Service Shop.

Need New Motors Or Starters?

For motors from one hp up to the largest sizes — with Allis-Chalmers controls to match — call your nearby A-C Dealer or Sales Office.

A-2949

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

Sold . . .
Applied . . .
Serviced . . .

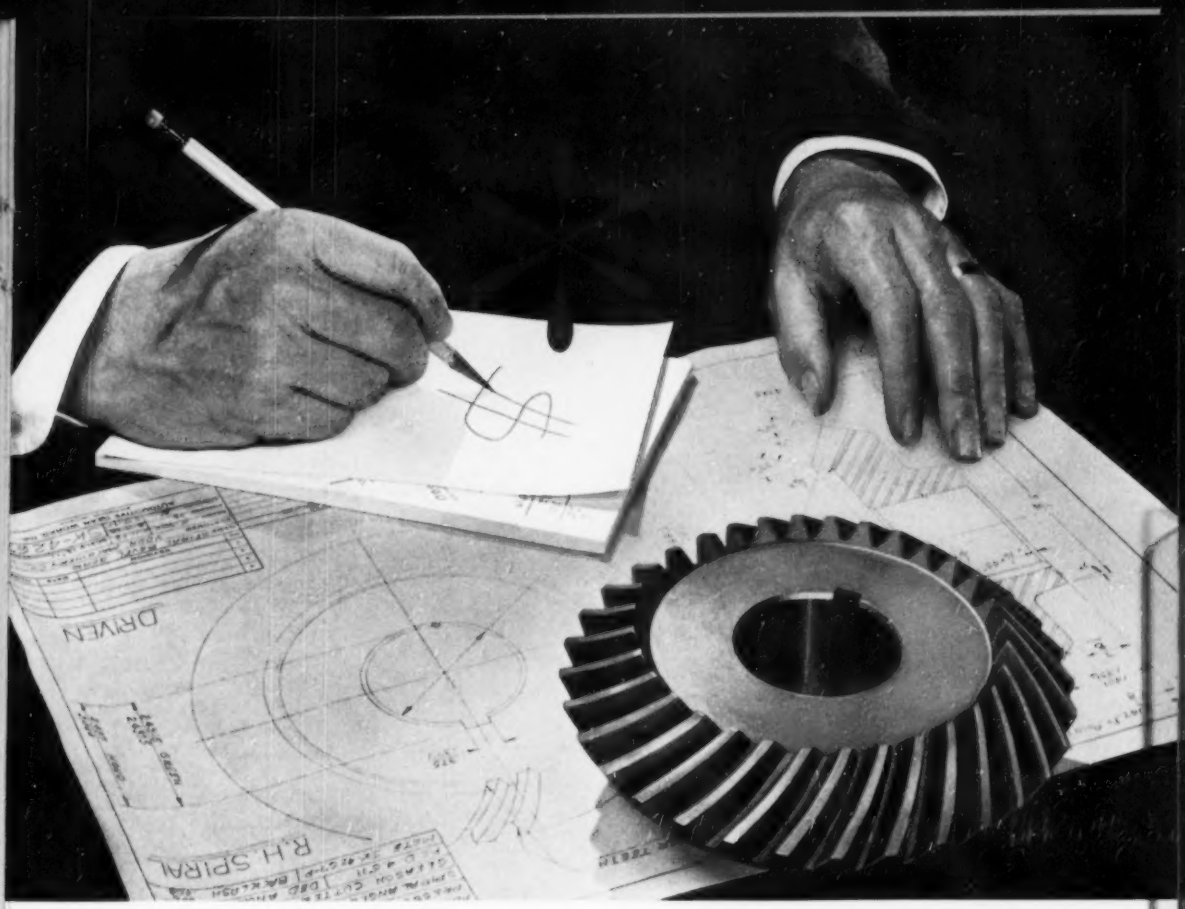
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS



* What do you mean—"*How much?*"

You're buying gears. You naturally want to know "*How much?*"

How much what?

How much they will cost per unit on delivery? That's *one* important consideration, but not the only one by any means.

How much will they save on installed cost?

How much will they add to the saleability, performance, and endurance of your product?

How much (or how little) will they crowd tolerance limits?

How much will they relieve you of service headaches and expenses?

How much will they reflect the experience, integrity, and skill of their makers?

And how much will the manufacturer respect your delivery requirements?

When your "*How much?*" means all this—and not just first price alone—you're talking "Double Diamond" language. You're speaking of long-term value and long-term thrift, of lowest final cost. You're buying gears on the basis that has steadily built "Double Diamond" volume and reputation through almost thirty-five years of gear-making.

DOUBLE DIAMOND TRADE MARK GEARS

Made by

Automotive Gear Works, Inc.

RICHMOND, INDIANA

• • • • • FOR AUTOMOTIVE FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS • • • • •

*Reg. U.S. Pat. Off.

Job File No. 194

MALLEABLE NUT PRODUCTION *Fully Automatic* CONTROLLED BY T-J CYLINDERS

All moving parts are controlled hydraulically by T-J Cylinders —on this Malleable Nut Production Machine designed and built by Roy Hays & Associates, Rockford, Ill., for the Wagner Malleable Products Co., Decatur, Ill.

It's *fully automatic*—the operator only places nuts in stations. Nine T-J Cylinders, 40 ton to ½ ton, help complete the job of cutting off sprue, sizing, boring, facing, chamfering and threading 2,500-¾ std. pipe thread nuts per hour.

For your tough jobs of power movement —pushing, pulling or lifting—*save labor, speed production* and *cut costs* with T-J Air and Hydraulic Cylinders! Many standard sizes and styles . . . both cushioned and non-cushioned types . . . 100 lb. or 50,000 lb. Precision-built for long-life dependability. Write for latest catalogs. The Tomkins-Johnson Co., Jackson, Michigan.

FOR POWER MOVEMENT IN ANY DIRECTION

100 LB. or 50,000 LB.

32 YEARS EXPERIENCE

T-J

TOMKINS-JOHNSON

RIVETORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

New, Unique Simplicity!...

in custom-engineered

ELECTRONIC INSPECTING AND SORTING EQUIPMENT

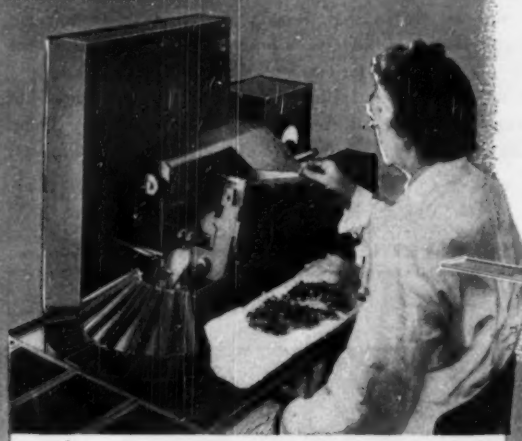
Through basic engineering developments, Brown & Sharpe custom-builds uniquely simple inspecting and sorting machines for precision parts. Machines of this description made by Brown & Sharpe have the advantages of simpler, sturdier construction; more stable adjustments; and easier manipulation of sensitivity.

This modern equipment can be designed and built to meet individual needs for:

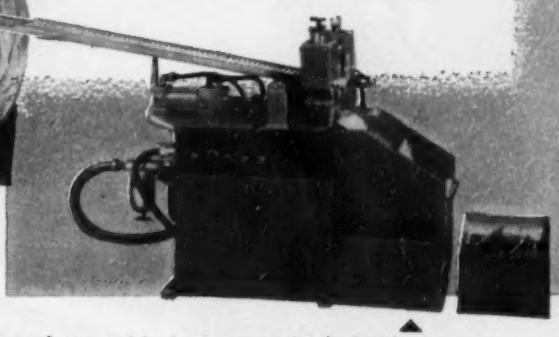
1. *Manual loading and disposal*
2. *Manual loading and automatic disposal*
3. *Automatic loading and automatic disposal*

Why not turn over your problems of providing efficient gaging and sorting equipment to Brown & Sharpe? Send an outline of your requirements. Learn what Brown & Sharpe can offer in custom-engineered equipment. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

Visit Booth No. 849, A.S.T.E. Show, Philadelphia



This single-motor, compact machine automatically gages and sorts antifriction bearing rolls. It rejects rolls above or below manufacturing tolerance and separates accepted rolls into 5 sized categories, in increments of .00002".



This machine gages and sorts straight sleeves—measuring for length as well as diameter at both ends. The sleeves are segregated into four categories. 1. *Oversize and undersize in length regardless of diameter.* 2. *Small in diameter at either or both ends.* 3. *Large in diameter at either or both ends.* 4. *Good sleeves within tolerance.*

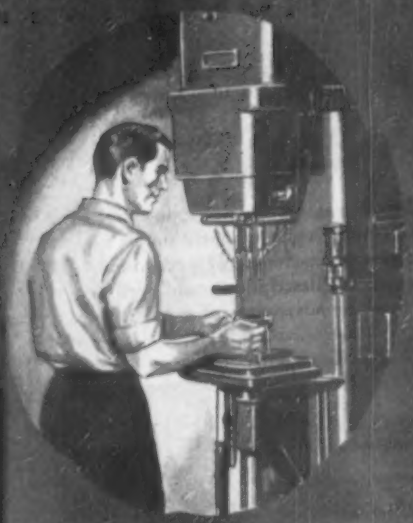
The machine has a production rate of approximately 3000 per hour. The capacity is adjustable for different lengths and diameters. It is loaded manually with automatic disposal.

BROWN & SHARPE

CORRECT USE OF

WINTER

CHIP DRIVER TAPS

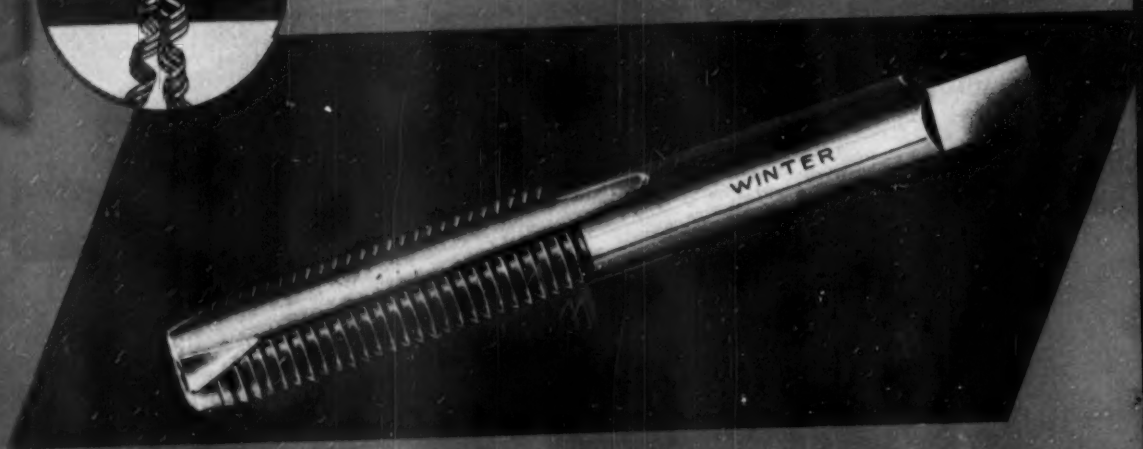


One of the important problems on many high speed production tapping jobs is to get rid of the chips without choking the tap or scratching the completed thread.

Winter Balanced Action Chip Driver Taps (Spiral Point) do this successfully. The accurately ground and scientifically designed chip driver contours drive the chips ahead of the tap, so that no chip choking can occur. These taps are suitable for a wide variety of tapping operations, but are not recommended for use in blind holes.

Other Winter products include Precision Commercial and Cut Thread Taps of all common types, such as Four Flute, Three Flute, Machine Screw and Pipe Taps and many others.

ALWAYS AT YOUR SERVICE—YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.



WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company

Rochester, Michigan, U. S. A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

THE WIDE APPLICATION NATIONAL END MILLS

A wide variety of milling operations that cannot be done by any other tool can be advantageously performed by end mills.
National End Mills are available in a great many types and sizes to meet these varied job requirements.
Shell End Mills, Heavy Duty Taper Shank End Mills, Helex End Mills in Single and Double End construction, small diameter Short Series End Mills and many others are available from stock.
National Engineers will recommend the best type for your application.
The complete National line also includes Twist Drills, Reamers, Counterbores, Milling Cutters, Hobs, and Special Tools.

"CALL YOUR DISTRIBUTOR"—It is NATIONAL'S firm belief, based on long experience, that the local industrial distributor is the one best source for all staple industrial needs—including NATIONAL Metal Cutting Tools.

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER MICH. U.S.A.

National

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U. S. A.
Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

Another user finds

COPYMATIC "SUPERIOR"

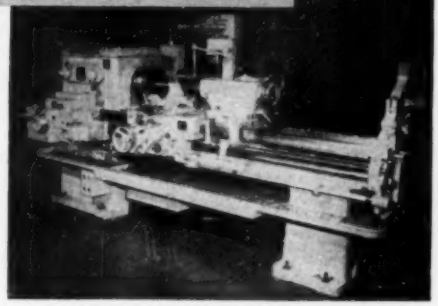
"Lower Tooling Cost...
Simplicity...
Speedy Changeover"

says Continental Motors Corporation
Muskegon, Mich.

DUPLICATE PARTS OR
DO REGULAR LATHE WORK
...get instant changeover
ONLY with the Copymatic

MACHINING cylindrical steel parts in limited lots, a Lodge & Shipley COPYMATIC Lathe aids in the production of famous "Red Seal" Continental Engines. Read what a production executive of this firm has to say: "We purchased a 16" Lodge & Shipley Lathe, with Copymatic attachments, to answer our needs of a machine for contour turning, facing, chamfering, etc., cylindrical steel parts in limited lots for our production. The set-up has proven very satisfactory in every respect and especially from the standpoint of low tooling cost and simplicity and speed of changeover."

With a COPYMATIC, you get all the convenience and speed of hydraulic duplication, plus the outstanding versatility of the Lodge & Shipley "Model X" Lathe. You get instant changeover from standard lathe operation to automatic duplication or vice versa. Using either round or flat templates, the COPYMATIC reproduces square shoulder faces, grinding necks, tapers in both directions, chamfers and curved contours. Often a special template is eliminated. The first piece, produced by standard operation, is inserted between the template supports and the rest of the lot produced automatically.



Without the limited use and resulting higher costs of a "special purpose machine," the COPYMATIC is a profitable producer in any size shop. Ask a Lodge & Shipley Representative for additional details or write for Bulletin No. 675.

THE **Lodge & Shipley** COMPANY
MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

Lower Costs on Machining Cast Iron Supply Drums with this New Baush Vertical Multi-Spindle Machine . . .

Operations on castings:

1) 3 holes drilled and spot faced
2) Table moves—bringing holes beneath tapping spindles
3) Simultaneously, casting is automatically positioned and 3 more holes are drilled and spot faced
4) During dwell period leadscrew spindles move to top first 3 holes
5) Cycle begins again—steps 1 to 4 until all holes ase finished.

that efficiently handles and machines various sizes of heat radiation supply drums.

Using special fixed center head with both drilling and individual leadscrew tapping spindles coordinated with an hydraulic cross slide carriage, holes are machined in sequences of three. Drilling and tapping spindles have individual motor drives. An additional salvage tapping spindle is provided to prevent spoilage due to inferior castings.

Another example of Baush Engineering ingenuity. Send us your production problems.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Only MARVEL *builds all four**

While it is true there are several builders of hack sawing machines and many builders of band sawing machines, only MARVEL builds *BOTH* hack saws and band saws. The fact is that MARVEL manufactures 35 models of 10 basic types of metal sawing machines which include the world's fastest automatic production saw, the world's largest giant hydraulic hack saws, the world's most versatile band saw and the most widely used small shop saws.

With intimate and broad field experience in all types of metal cutting-off equipment and 35 different saws available, it is obvious that MARVEL Field Engineers occupy a unique and exclusive position in the industry. They are eminently qualified to make expert and *unbiased* recommendations covering the type, size and model of metal sawing equipment best suited to individual requirements—the most efficient, most accurate, fastest, broadest in scope and the most economical.

MARVEL is also the only manufacturer of both metal sawing *machines* and metal sawing *blades*. Because the efficiencies of both the machine and the blades are interdependent, each upon the capability of the other, expert knowledge covering both saws and saw blades is essential to the proper appraisal of any specific sawing situation. Correct balance of cutting speed and blade life, feed pressure and blade tension are all potent factors in over-all performance. Here again it is the MARVEL Field Engineer who is qualified to provide the comprehensive answer to your question. His job is to help you saw metal most efficiently—his services are available upon request—gratis.

Write for Catalog 49

***HACK SAWING MACHINES**

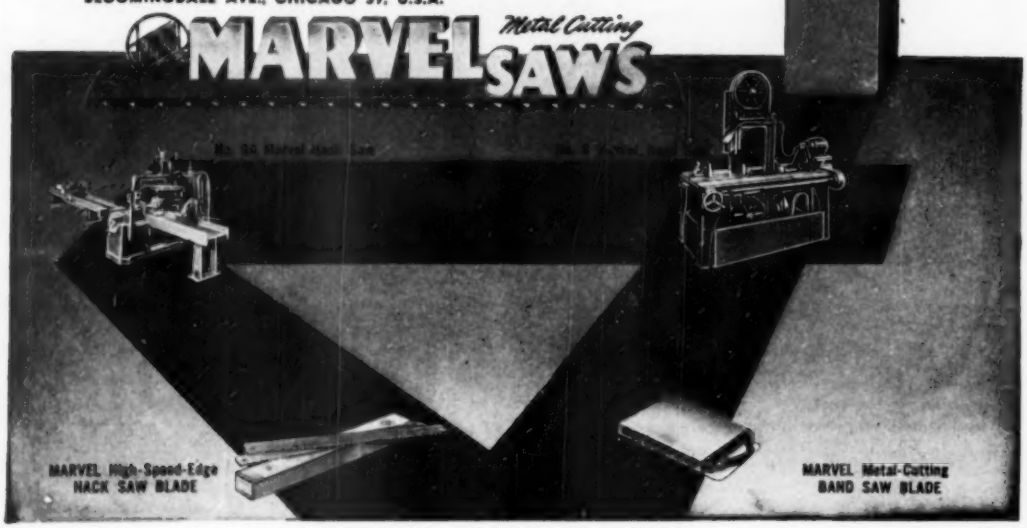
***BAND SAWING MACHINES**

***BAND SAW BLADES**

***HACK SAW BLADES**

4

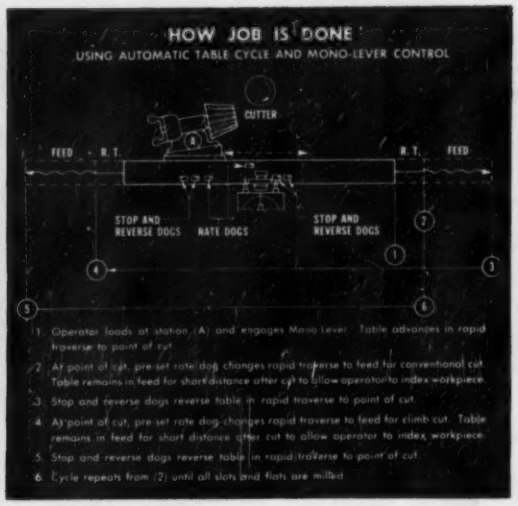
ARMSTRONG-BLUM MFG. CO.
BLOOMINGDALE AVE., CHICAGO 39, U.S.A.



Looking for savings?

96% INCREASE IN PRODUCTION SHOWN ON THIS JOB

Here's modern profit-making in action! This new Kearney & Trecker Model 2H Plain Automatic Cycle milling machine with Mono-Lever control increased production on this complex cast aluminum part 96%.


HOW JOB IS DONE
USING AUTOMATIC TABLE CYCLE AND MONO-LEVER CONTROL
CUTTER
FEED
R.T.
R.T.
FEED
STOP AND REVERSE DOGS
RATE DOGS
STOP AND REVERSE DOGS
1. Operator loads at station (A) and engages Mono-Lever. Table advances in rapid traverse to point of cut.
2. At point of cut, pre-set rate dog changes rapid traverse to feed for conventional cut. Table remains in feed for short distance after cut to allow operator to index workpiece.
3. Stop and reverse dogs reverse table in rapid traverse to point of cut.
4. At point of cut, pre-set rate dog changes rapid traverse to feed for climb cut. Table remains in feed for short distance after cut to allow operator to index workpiece.
5. Stop and reverse dogs reverse table in rapid traverse to point of cut.
6. Cycle repeats from (2) until all slots and flats are milled.

Here's how this big production increase was accomplished. Table cycle was preset to allow for indexing. Backlash eliminated by adjustable table feed screw nut — climb and conventional cuts were done equally well.

COMPARE

Production by old method.

Production gain using a Kearney & Trecker Milling Machine with Mono-Lever Control and Automatic Table Cycle.

HERE'S GRAPHIC PROOF OF SAVINGS

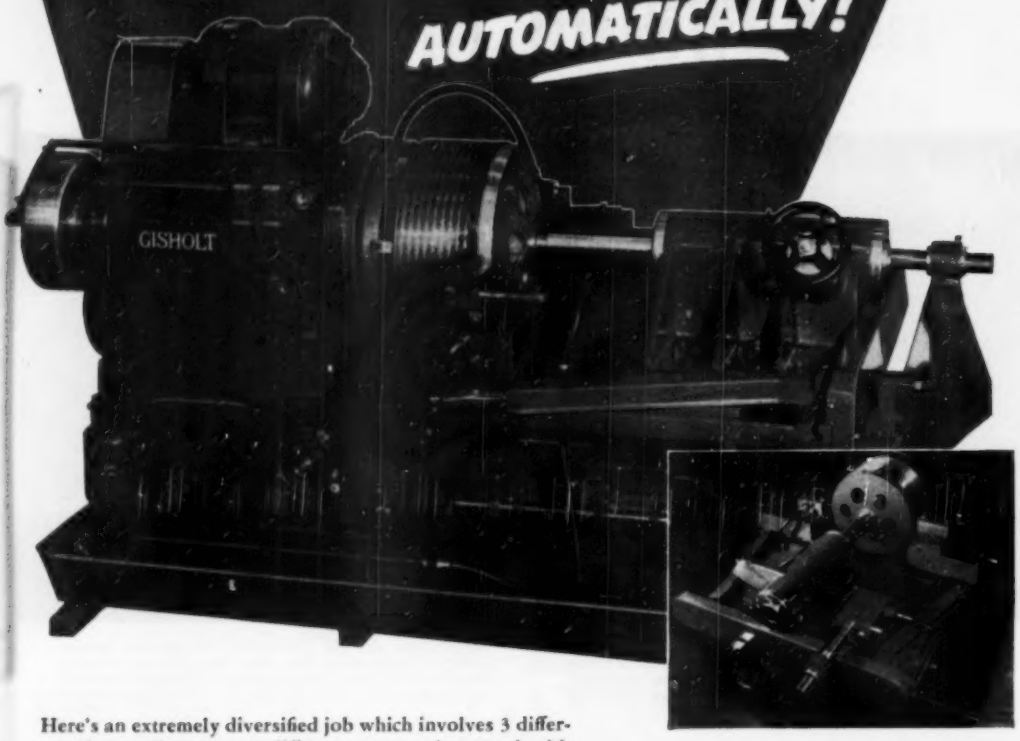
1. 16%—The minimum over-all savings reported from any job when done on a Kearney & Trecker Milling Machine with Mono-Lever Control and Automatic Table Cycle.
2. 16%-49% — The *majority* of over-all savings from jobs done on these machines fall here.
3. 49%-96%—Under favorable conditions, several jobs done on these machines have shown savings like this!

YES, here is a positive answer to cutting high shop costs — Kearney & Trecker milling machines with Mono-Lever control and Automatic Table Cycle.

The job data shown here, plus the bar graph, at the left, shows what other users have done AND *what you can expect* . . . savings of 16% to 96% on most milling operations.

Contact us or our nearest representative today. Get the facts on how Kearney & Trecker milling machines with Mono-Lever control and Automatic Table Cycle can cut your costs, increase your savings. No obligation. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

How the SIMPLIMATIC machines 212 different multiple V-belt sheaves AUTOMATICALLY!



Automatic pawl fitting into notched bar sets groove position. A single tool bit on the front slide roughs, while the tool bit on the rear slide finish forms. At end of cut, table is automatically repositioned for next groove. Spindle stops and table retracts automatically at end of job.

Here's an extremely diversified job which involves 3 different sheave diameters, 3 different groove sizes—and with from 3 to 10 grooves on each sheave . . . a total of 212 different combinations! Yet the entire job is simplified to *one* machine—the Gisholt SIMPLIMATIC. The SIMPLIMATIC handles them all automatically—with various pick-off gears and face clamps. The grooves are machined progressively one at a time to avoid excessive heat and strains in the workpiece. Total machining time ranges from 2.7 minutes for the smallest to 11.5 minutes for the largest.

It's one more example of the amazing versatility of this automatic machine. Investigate the SIMPLIMATIC before you invest in a special machine.

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

MACHINING TIME ON VALVE BODIES CUT 66⅔%

—WITH NEW SERIES KING

"Machining time on chrome nickel iron butterfly valve bodies has been reduced from 9 hours to 3 hours, with much better accuracy and finish." That is the report of the Henry Pratt Company, Chicago, on the performance of their New Series 72" KING Vertical Boring & Turning Machine shown above. These are not unusual results—they are typical KING results. It's paying others to investigate "The KING Way". Maybe we can show similar savings on your jobs. Complete information available without obligation.

10 SIZES SINGLE COLUMN: 30", 36", 42"—DOUBLE COLUMN: 52", 62", 72", 84", 100", 120", 144". ALL SIZES ARE AVAILABLE IN A WIDE VARIETY OF HEAD COMBINATIONS, WITH OR WITHOUT SIDE HEAD.

SEND FOR NEW CATALOGS

New illustrated KING Catalogs give full description of machines and detailed specifications. Catalog K-1 features Machines sizes 30", 36", and 42"; K-2, sizes 52", 62", and 72"; K-3, sizes 84" and 100"; K-4, sizes 120" and 144". Catalogs requested will be sent promptly.

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

3 way approach to production

Two 21/64" holes drilled by this unit equipped with two-spindle drill head
This unit with two-spindle drill head drills two .261 holes
This angular unit hollow mills piece 1½" in diameter and faces end to length

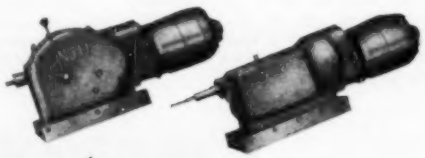
The problem of drilling, milling and facing a very irregularly shaped piece in this job was solved by Hartford Special Engineers by means of a special two clamp fixture and a way type machine with three automatic units. The success of the machine is proven by the production rate, 175 pieces per hour. The solution of complicated problems in Automatic Drilling and Tapping machines as well as general single purpose special machines has made Hartford Special the "standard for specials."

"Packaged Engineering"

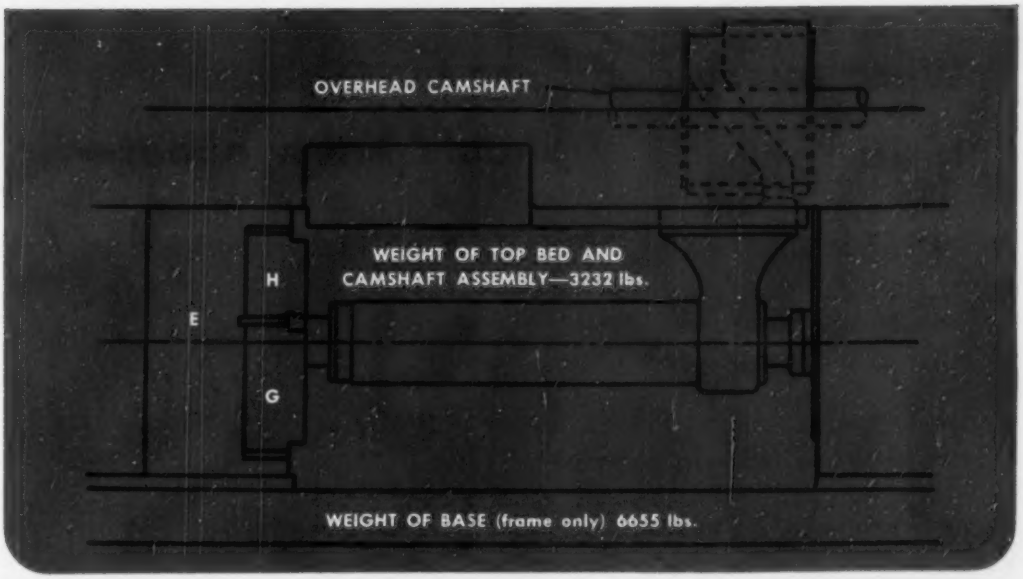
featured in all "Hartford Special"
AUTOMATIC DRILLING & TAPPING MACHINES

If you want economy and production in a single purpose machine, you'll be pleased at the advantages "Packaged Engineering" has to offer. Write our engineering department now. The Hartford Special Machinery Co., Hartford 5, Conn.

HARTFORD *Special*
... the best buy in the long run



Remember
For special applications, Drilling and Tapping Units with or without attachable heads are available individually.



PROFITS BEGIN WITH GOOD BUYING

Machine selection is often the difference between profit and loss, and the choice of one brand over another can be a vital decision. A machine that is not put to its best use is theoretically idle. A poor selection takes toll of all brands of the same type through greater sales resistance and cost. The information prepared for better machine selection before the purchase should be as thorough and useful as that of the operation and maintenance hand books supplied after.

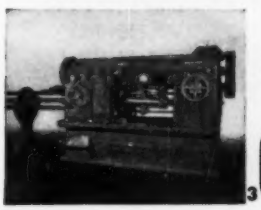
The information given above and below is useful in determining the facility of the 1½" Six Spindle CONOMATIC MAIN CROSS SLIDES:

1. **They have never been equalled for dependable, low cost operation and maintenance in the handling of wide, heavy, form cuts.**

The four, rectangular, box type, CROSS SLIDES, H and G, on front and rear sides of the machine, are nickel moly iron normalized. Their total weight is 296 lbs. They are held in axial position by retaining gibs against the finished wall surface of the machine frame support. They are held in parallel, radial position by their top and bottom flat bearing surfaces with tapered gib adjustment. The total area of their radial bearings, alone, is 444½ square inches.

2. **They have a higher maximum load recommendation than do the cross slides of other "automatics."**

The maximum load recommendation for each MAIN CROSS SLIDE is 3200 ft. lbs. The short (22" high) 11¾" by 44" Frame Support, E, weighs 802 lbs. net. It holds the slides between, and in close proximity to, nearly FIVE TONS of "bridged" construction.



Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

What every good production man should know about—

Production advantages of
Magnesium Die Castings

It is among production men who have worked with magnesium die castings that magnesium finds some of its strongest supporters. These men know from actual experience that light, strong magnesium die castings have production advantages not offered by any other die casting metal.

Magnesium's freedom from a tendency to solder to the steel dies or cores is an important production plus. This makes it possible to produce castings with extremely small cored holes and holes with little taper and in special cases without taper. Consequently castings that require complicated coring are generally easier to produce in magnesium. Another inherent advantage of magnesium die casting alloys is the absence of growth in dimension with age. Tolerances of ±0.0015 inch per linear inch can be maintained on production runs.

Any machining required can be done faster and more economically on magnesium, for it's easiest of all die casting metals to machine. Magnesium die castings are readily adaptable to a wide variety of protective and decorative finishes.

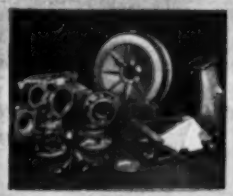
Most important of all, *magnesium die castings are competitively priced!* In general, they cost no more than die castings in other materials, and in some cases they are cheaper.

Get more information about how magnesium die castings can cut your production costs. Call the nearest Dow sales office or write direct.

MAGNESIUM CAN ALSO BE ECONOMICALLY FABRICATED INTO

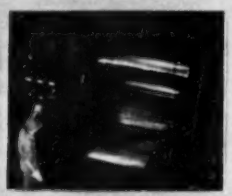
EXTRUSIONS

Magnesium can be extruded into an almost unlimited variety of shapes and sizes. Tailored to the job, they can often eliminate costly forming and fabricating.



SAND AND PERMANENT MOLD CASTINGS

Magnesium sand and permanent mold castings are used where light weight, high strength, resistance to shock and excellent machinability are required.



SHEET, STRIP AND PLATE

These forms have the same high strength-weight ratio possessed by other forms of magnesium. For sheet applications requiring lightness, rigidity, and durability, try magnesium.

Magnesium Division, Dept. MG-39 • THE DOW CHEMICAL COMPANY • Midland, Michigan

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit • Chicago • St. Louis
Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

MAGNESIUM

Many Finishes Available for Magnesium

Magnesium alloys exhibit good resistance to weathering under ordinary atmospheric conditions and have given good service in many industrial applications for the past quarter of a century. There are a great variety of easily applied protective and decorative finishes available to further improve magnesium's surface stability.

Bright metallic or frosted luster and other decorative effects are easily obtained by chemical baths and colored coatings can be produced by use of anodic treatment. For best results, decorative finishes are followed by clear lacquer or waxing. Dow research has recently developed an electroplating process that permits the economical use of all common plating metals on magnesium.

The application of paint systems to magnesium requires the same techniques used for other metals. Paint should be applied over properly chemically treated surfaces.

For information on finishing magnesium call the nearest Dow sales office or write direct.

Things to Remember

1. Always paint over properly treated surfaces —recommended chemical treatments are available.
2. Be sure surfaces are clean and dry before each coat of paint is applied. A large percentage of paint failures can be attributed to painting of damp or improperly cleaned surfaces.
3. Choose priming and finishing materials with care. Always use a material recommended for the job.

MACHINING

Magnesium permits deeper cuts and higher feeds and speeds than any other metal. The absence of any tendency to tear or drag results in excellent surface finish. Tapping can be done at high speeds.

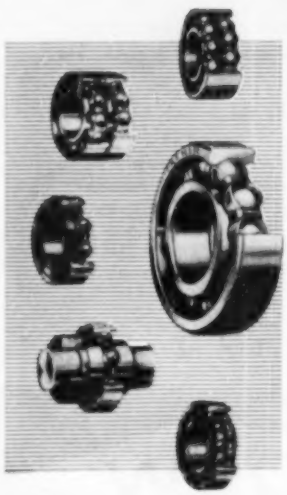
FORMING

The recognized practice of hot forming magnesium permits deep draws in one operation —eliminates repeated annealing and multiple sets of dies.

JOINING

Established and well defined procedures are used in joining magnesium. All the usual methods employed on other metals including riveting, welding and brazing are in common use.

HERE'S HOW...



FAFNIR USES 20 LINDBERG CYCLONES

..to draw thousands of types of bearings!

The Fafnir Bearing Company, New Britain, Conn., uses Lindberg Cyclone Furnaces to draw thousands of types and sizes of its line of ball bearings. They say:

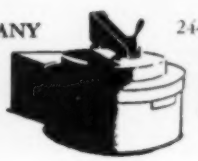
"The metallurgical department of our company entrusts the major part of its drawing operations to Lindberg Cyclone Furnaces because it has found them to be dependable work horses. At the present time there are 20 in use in the Company's three ball bearing plants in New Britain, Conn.

"They have given excellent continuous service for more than 8 years. For long periods they were operated 24 hours a day, seven days a week, (at temperatures ranging from 275 to 1200°F.) without downtime due to furnace failure.

"Because the Fafnir line of ball bearings,comprising thousands of types and sizes, is considered the most complete manufactured in this country, the Lindberg Cyclones draw a considerable variety of parts. The work varies from small to large dense loads (up to 1600 lbs.) of bearing rings, balls and rolls, yet the uniform results demanded for the manufacture of precision products is constantly being achieved—and in an atmosphere of cleanliness and satisfactory working conditions."

Local Offices in every industrial center.

LINDBERG ENGINEERING COMPANY 2445 W. Hubbard Street, Chicago 12, Illinois.

LINDBERG  **FURNACES**

Only the original Modern-Magic Chucks and Collet Equipment carry the name "Modern-Magic". Manufactured by Modern Tool Works, Rochester, New York

MODERN-MAGIC

Quick Change

CHUCKS and COLLET EQUIPMENT

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

The set-up shown above is typical of the increased production obtainable using Modern-Magic Quick Change Chucks and Collet Equipment. Here, the two spindles of the machine, Modern-Magic equipped, perform four separate operations. The tools are quickly and easily changed while the machine runs at operating speed. You don't even have to slow it down.

Simple, advanced design makes Modern-Magic Chucks and Collets practically trouble-free. Sturdy, fool-proof construction insures longer, accurate service.

Try Modern-Magic Quick Change Chucks and Collet Equipment on your next close-figured job. Prove their higher production, lower cost operation to your own satisfaction.

Write for full information covering Modern-Magic Quick Change Chucks and Collet Equipment

MODERN TOOL WORKS

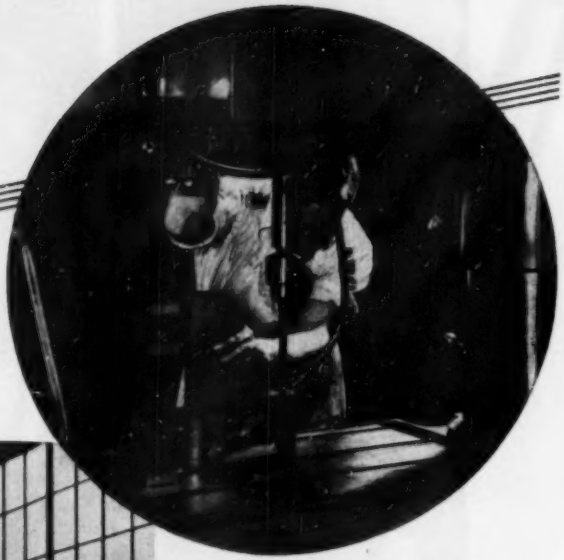
DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

FOSDICK *Sensitive* RADIALS

for greater efficiency on more operations!



Illustrating an interesting job being drilled on a FOSDICK Sensitive RADIAL at the plant of Benjamin E. Jarvis, Newark, N. J.

● One of the outstanding advantages of this new FOSDICK Sensitive RADIAL is the big increase in range of sensitive operations it can handle—easily—quickly—economically.

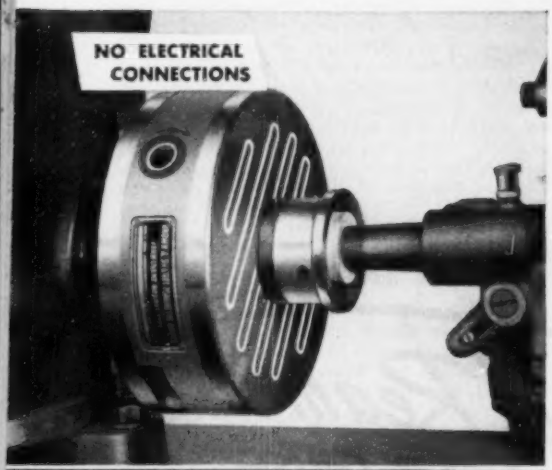
The one piece column provides additional strength and rigidity. The adjustable table which can be moved either by power or hand assures work in correct position for the job at hand. The flexibility of the table and arm, both of which swing in an arc of 360° on the column, permits a wide range of work to be handled and the arm at fixed height assures ease of operation on all jobs.

The machines are available in 3 and 4 foot sizes. There are nine spindle speeds and four feeds and both speeds and feeds are controlled by direct reading levers on the head.

For complete details write for the Fosdick Sensitive Radial Bulletin, S.R.A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

Powerful Permanent Magnet Chucks



that simplify layout work, testing, inspecting, grinding and light machine operations

Wherever these Brown & Sharpe permanent magnet chucks are in use, time-consuming holding jobs are made easy — economical. By a simple turn of a lever, work is held securely — another turn releases work instantly. The amount of holding power may be varied to permit accurate positioning of work.

With these chucks, no jigs or fixtures are needed. No clamps. No vises. No risk of distorting work through uneven pressure. The chucks are portable . . . instantly usable . . . and will hold work as long as desired without damage to work or chuck because they do not heat. Used for wet or dry grinding.

WIDE RANGE OF TYPES AND SIZES

Brown & Sharpe Permanent Magnet Chucks are available as follows:

RECTANGULAR MODELS, 8 sizes, to 12⅛" x 36".
ROTARY MODELS, 3 sizes — diameters — 5", 7", 9".

Also available . . . auxiliary top plates, magnetic chuck parallels, magnetic blocks with V or plain face and other useful holding aids.

ECONOMY FEATURES

NO INSTALLATION COSTS
NO OPERATING COSTS
PORTABLE • ADAPTABLE
SAFE • LONG-LIFE
SIMPLE TO USE

For sale only in the United States of America and its Territories. Write for Catalog describing operating principles and specifications. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE B·S

Good Reamers + PROPER CARE = lower production costs

It's simple arithmetic. And it's good business, too. This PEERLESS High Speed Expansion Reamer is the best you can buy, regardless of price. When it becomes dull it may be expanded and resharpened, not once but many times. The number of times that it may be restored to its original serviceable condition *depends on the care you give it.* For helpful hints on the proper care and sharpening of expansion reamers, ask our nearest Stockroom to send a Service Representative, or . . .

Telephone Your Industrial Supply Distributor

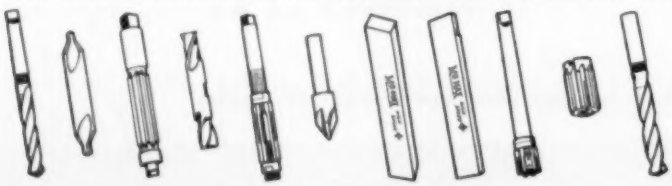
THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS



CLEVELAND

DISTRIBUTORS EVERYWHERE are ready to serve you!

LOOK AT THIS PRESS

It's designed to provide industry with low-cost, high production units that are highly flexible in design and operation... relieving heavier presses of short runs and lighter work. Presses are practically fool-proof in operation. Frame is extremely rugged. Fingertip controls are conveniently located at hand level. Available for immediate delivery, in standard width (between uprights) of 24"—31"—36"—42" respectively. Available in special width up to 72" at small additional cost. Movable bed plates. Pumping unit has by-pass relief valve which can be set at any pressure up to press capacity. *All Standard* presses equipped with 2-speed built-in hand pumps for more sensitive and versatile operation.

READ THESE "SPECS":

CYLINDERS: *Standard Models* furnished with 6" bore, 7½" stroke—spring return type; also 5" bore, 7½" stroke—spring return type. Above presses are *standard*. Following can be furnished at additional cost: Double Acting, 6" bore, 7" stroke; 6" bore, 11" stroke; 5" bore, 7" stroke; 5" bore, 11" stroke. Special long stroke cylinders also available, up to 48" in length, for incorporation in suitable press frames of our make.

PUMPING UNITS: These units can be supplied in various volumes and pressures, in a total of 13 combinations.

CHECK THESE USES:

There are so many everyday production uses for these versatile KRW Hydraulic Presses that we have lost count. Here are a few of the more obvious . . . blanking, forming, bending, broaching, straightening, stamping, embossing, numbering, upsetting, laminating, pressing and hot or cold forging. KRW Engineers are daily developing other uses. If you have only a vague idea of how these presses might be used in your plant, let us have it in a rough form. We'll do the rest.

BEAT THESE PRICES*:

Depending upon capacity of pumping equipment, prices of Standard model motor driven hydraulic presses are as follows, F. O. B. Factory: 25-ton press from $727.00 to $992.00. 50-ton press from $806.00 to $1058.00. 60-ton press from $1070.50 to $1135.00. 75-ton press from $1198.00 to $1258.00. All motors in the above units are 220/440 volt, 3 phase, 60 cycle. Any change in motor specifications is extra. ***Subject to change without notice.*

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.

MAIL THIS COUPON

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

Please send me complete information on KRW Motor Driven Presses as follows:

☐ 25-ton ☐ 50-ton ☐ 60-ton ☐ 75-ton presses

☐ motor drive conversion unit ☐ Press Cap.

Serial No. .....

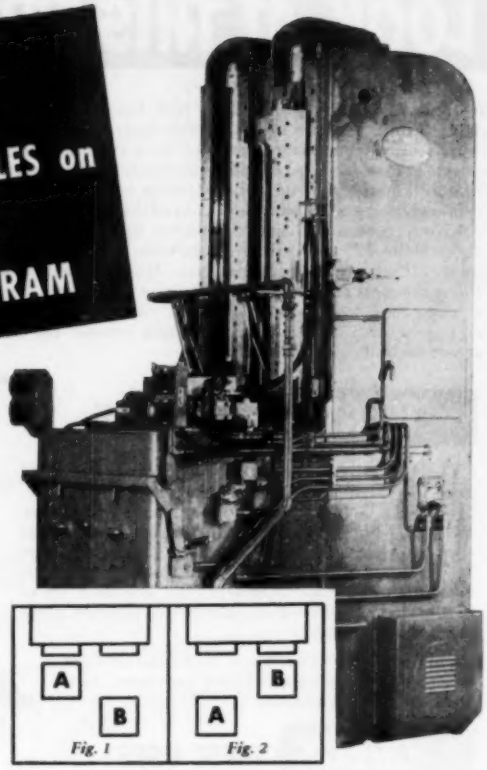
Name .....

Address .....

City and Zone ..... *State* .....

11

Broaching WHEEL SPINDLES on American DUAL RAM



Straddle broaching the flange faces and the stem end of automotive wheel spindles in one pass was a broaching operation easily adapted to the American Dual Ram Surface Broaching Machine.

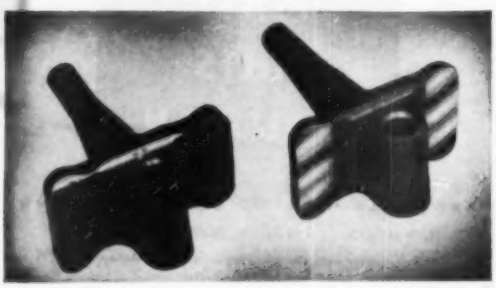
The combination of broaching the flange faces and stem end in one pass was possible because of the wide machine slides which are a standard feature on American machines. The part was manually located sideways on the fixture which was provided with a hydraulically interlocked clamp. As the broach assembly was duplicated on each ram and the fixture on each table, one part was broached complete in one pass at each station. This provided a high production rate for these wheel spindles, which are shown before and after broaching in the illustration below.

Fig. 1 *Fig. 2*

On the diagram above figures (1) and (2) illustrate the opening cycle of the receding type tables.

In figure (1) table (A) is in broaching position and table (B) is in unload and load position. In figure (2) the tables are reversed and the operator unloads and loads the fixture on table (A) while (B) is in broaching position.

All moving parts of the machine are electrically interlocked as a safety precaution for the operator and the tooling. The machine cycle can be arranged for semi-automatic operation whereby the operator starts each cycle or if the loading time does not exceed the broaching time continuous automatic cycle can be used.



American manufactures a complete line of hydraulic broaching machines for surface and internal operation.

If you have a metal removing operation send a blue print of the part with the required dimensions and hourly production. American engineers will recommend the machine and tooling for the operation without obligation. *Write for free literature Circular 300 covering American's complete line of hydraulic surface broaching machines.*

AMERICAN **American BROACH & MACHINE CO.**

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

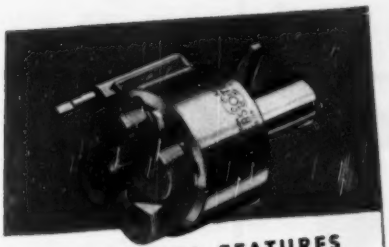
ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

VERS-O-TOOL—THE STANDARD

At Addressograph-Multigraph

FOR THIS CLASS OF WORK



VERS-O-TOOL FEATURES

1 Threading close to shoulders and positive quick opening action are characteristics of DBS die heads, built especially for Brown & Sharpe Automatics.

2 Circular chasers are always up to correct position—assuring precision threads and smooth finish.

3 Accuracy of thread form is assured throughout the life of a circular chaser, by means of direct micrometer check after each regrind.

4 Vers-O-Tool circular chasers are regrindable through a full 270°—an exclusive feature, for longer life.

5 Circular ground thread chasers are available in a full range of thread sizes—even down to 260 TPI.

In the modern Addressograph-Multigraph plant at Cleveland, Style DBS Vers-O-Tools are used *exclusively* for the vast quantities of threaded parts that flow from their battery of more than 60 Brown & Sharpe Automatics.

Here's why: the parts produced are largely adjustment-making screws used on their products. Thread uniformity and smooth finish are extremely important—there's no room for gradual deterioration of quality toward the end of the lot.

That's where Vers-O-Tools shine. Addressograph-Multigraph find they get 7,000 to 10,000 precision threads per chaser grind.

But that's only part of the story. Lower chaser costs, less tool inventory, faster production—all of these enter in. For complete details on how Vers-O-Tools can cut threading costs in *your* shop, ask for catalog D-49.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

HALLOWELL

SHOP EQUIPMENT OF STEEL

Ready-made, standardized, interchangeable units. Sturdy, welded construction lasts longer, minimizes maintenance.

WORK BENCH OF STEEL. Steel or laminated wood top.

CARRY-TOOL, the handier tool stand.

STEEL STOOL. Strong, welded construction.

FOREMAN'S DESK OF STEEL

STEEL POSTURE STOOL with adjustable back.

UNBRAKO

SOCKET SCREW PRODUCTS

Knurled, slip-proof cap screw heads speed assembly. *Knurled* points make set screws self-locking . . . "they won't shake loose!" Advanced manufacturing methods make UNBRAKOS stronger, tougher, more reliable.

KNURLED HEAD SOCKET CAP SCREW

KNURLED POINT, *SELF-LOCKING* SOCKET SET SCREW

KNURLED POINT, *SELF-LOCKING* SQUARE HEAD SET SCREW

KNURLED HEAD SOCKET STRIPPER BOLT

FLAT HEAD SOCKET CAP SCREW

DRYSEAL PRESSURE PLUG

FLEXLOC

SELF-LOCKING NUTS

One-piece, all-metal, for maximum strength—minimum trouble. Positive, *automatic* locking. FLEXLOCS serve as both *stop* and *lock-nuts*. "Positively won't shake loose."

SELF-LOCKING STOP NUT, REGULAR HEIGHT

SELF-LOCKING STOP NUT, "THIN"

EXTERNAL WRENCHING, *SELF-LOCKING* STOP NUT

See us at Space 128, A. S. T. E. Exposition, April 10-14, Convention Hall, Philadelphia

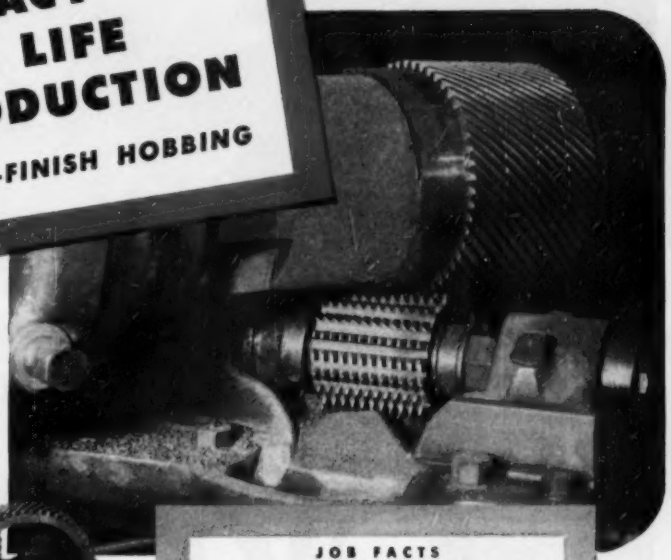
SPS

STANDARD PRESSED STEEL CO.

JENKINTOWN 1, PENNSYLVANIA

Get ACCURACY TOOL LIFE and PRODUCTION

WHEN SEMI-FINISH HOBBING



Use

BARBER-COLMAN "Multithread" HOBS

JOB FACTS

Operation — Semi-Finish Hob Helical Gears, 4 per load, 10 pitch, 54 teeth, 7" O.D.
Machine — Barber-Colman No. 16-16
Material — Cast Iron
Hobs — B-C "Multithreads" 4" x 4" x taper bore
Fl-to-Fl — 25 minutes per load
Feed — .065"/per rev.
Speed — 82.5 RPM
Tool Life — 800 pieces per hob sharpening
Accuracy — within .0006" involute

"Multithread" Hobs are the newest contribution to high speed gear hobbing. With these new *"Multithreads"*, gears are hobbed more rapidly so that frequently the number of machines required for semi-finishing can be greatly reduced. Their capacity for accuracy, tool life *and* production is established by their performance in this and many other jobs.

On these truck camshaft gears, for example, hobbing time has been cut *one-third*. Tool life averages 800 pieces per sharpening. Tolerances within .0006" are maintained on involute and pitch diameter.

Check these Job Facts and see if they compare with results on your semi-finishing jobs. Write Barber-Colman Engineers for estimates on your work.

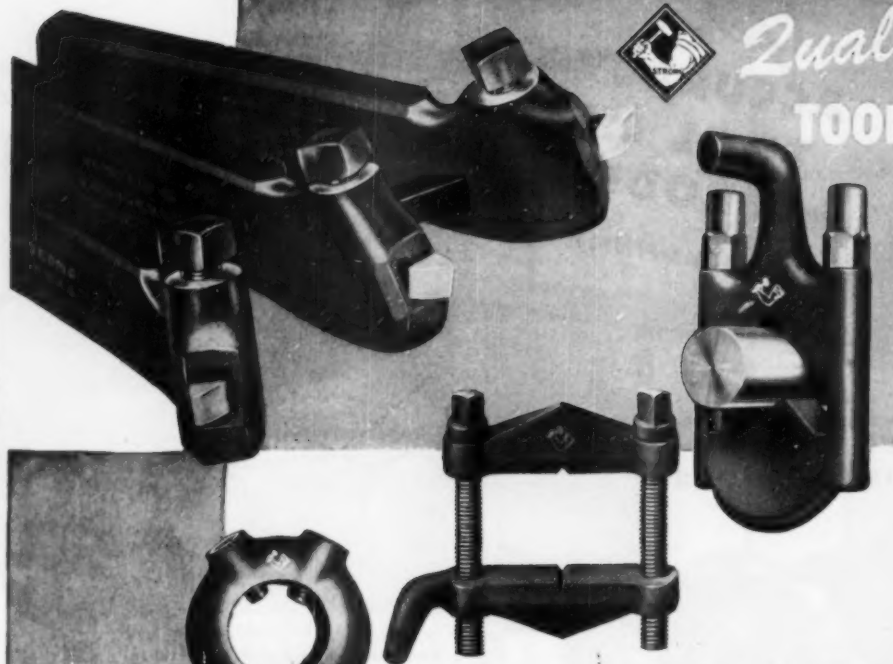
Barber-Colman Company

GENERAL OFFICES AND PLANT, 7112 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

COMPARE THESE JOBS!
Production records on 100 hobbing jobs. Write for Hobbing Data File No. 7112.

ARMSTRONG

Quality TOOLS



NOT A COST, BUT AN INVESTMENT

That Pays Year After Year. . .

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds, and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

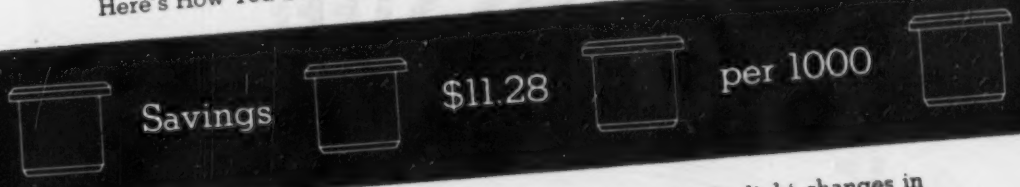
ARMSTRONG Quality pays back over and over again. *Write for new S-48 catalog.* It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

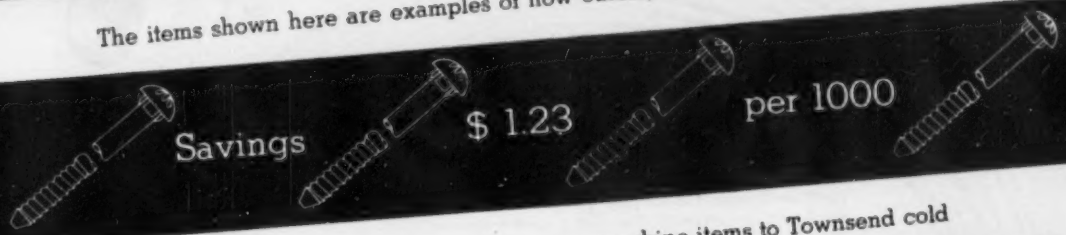
"The Tool Holder People"

5215 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

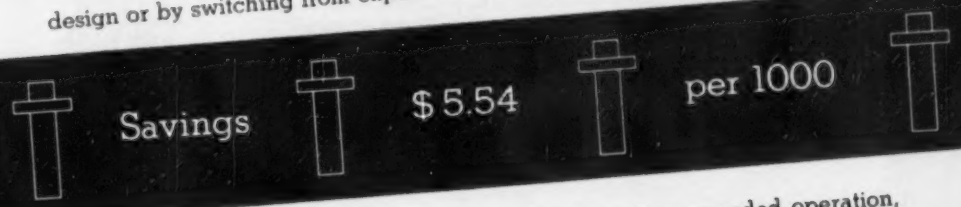
Here's How You Save Time and Money with Townsend Fasteners and Parts.



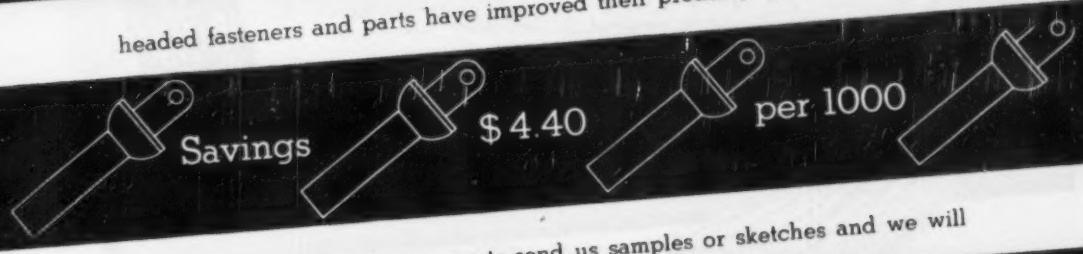
The items shown here are examples of how others, through slight changes in



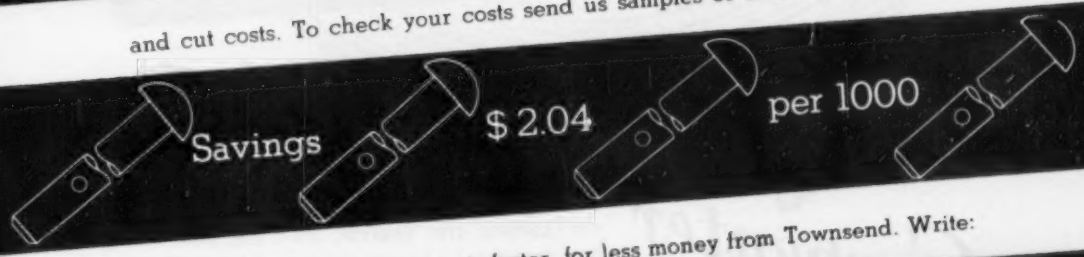
design or by switching from expensive screw machine items to Townsend cold



headed fasteners and parts have improved their product, speeded operation,



and cut costs. To check your costs send us samples or sketches and we will



suggest how you get better parts faster, for less money from Townsend. Write:

Townsend

COMPANY — ESTABLISHED 1816

New Brighton, Pa.
Chicago 38, Ill.

a NEW STAINLESS STEEL has been invented by *Carpenter*...

This new Chrome-Nickel Stainless can do things that the 18-8's can't do. Invented in Carpenter's laboratories, it is an austenitic steel *with an extremely slow rate of work-hardening.*

We call the new steel *Carpenter Stainless No. 10.* Its slow rate of work-hardening eliminates fabricating problems often encountered with the 18-8 grades of Stainless. The development of No. 10 makes practical for the first time the economical production of many kinds of Chrome-Nickel Stainless parts, such as recessed head screws and upset nuts.

Carpenter Stainless No. 10 can be cold worked much easier than Type 302 Stainless. Its corrosion resistance is equal to and in some cases better than the 18-8 types.

A technical bulletin describing Carpenter Stainless No. 10 will be mailed if you will drop us a line on your company letterhead. The bulletin will help you get to know this new Stainless, recently invented in Carpenter's laboratories.

Another *Carpenter* First!

Economical production of many Chrome-Nickel headed parts has been made possible by Carpenter's invention of a new Stainless Steel that has a very slow rate of work-hardening.

THE CARPENTER STEEL COMPANY, 109 *1.* Bern Street, Reading, Pa.
Export Department: 233 Broadway, New York 7, N. Y. "CARSTEELCO"

Carpenter

more than corrosion resistance

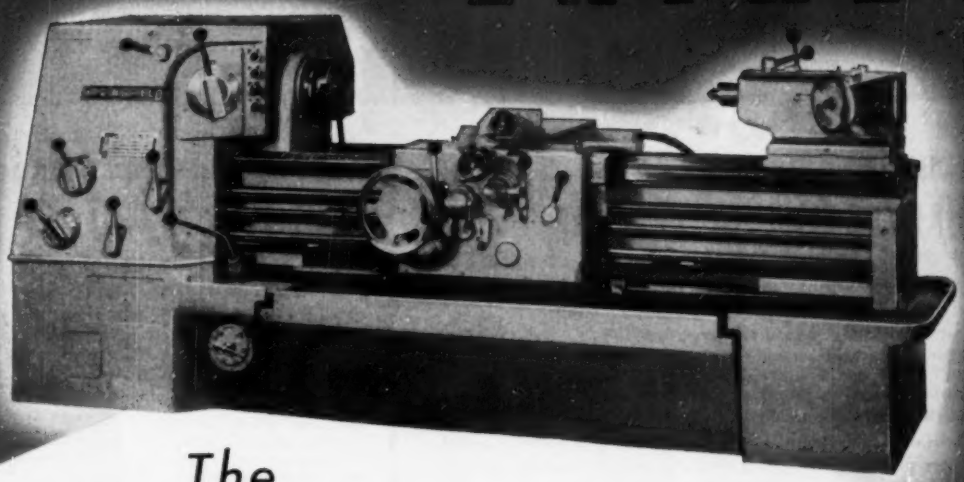
STAINLESS NO. 10

(Patent Pending)

FOR COLD HEADED AND UPSET PARTS

Type Analysis: Carbon ... 0.08% max. Chromium ... 16.00% Nickel ... 18.00%

New SPRINGFIELD Model S LATHE



The "World's Best Investment" in Lathes

NEW engineering designs give greater precision, rigidity and production capacity.

NEW control applications result in greater operating ease and efficiency.

NEW combinations of modern lubrication methods combat wear and reduce operating costs.

THE SPRINGFIELD MACHINE TOOL COMPANY

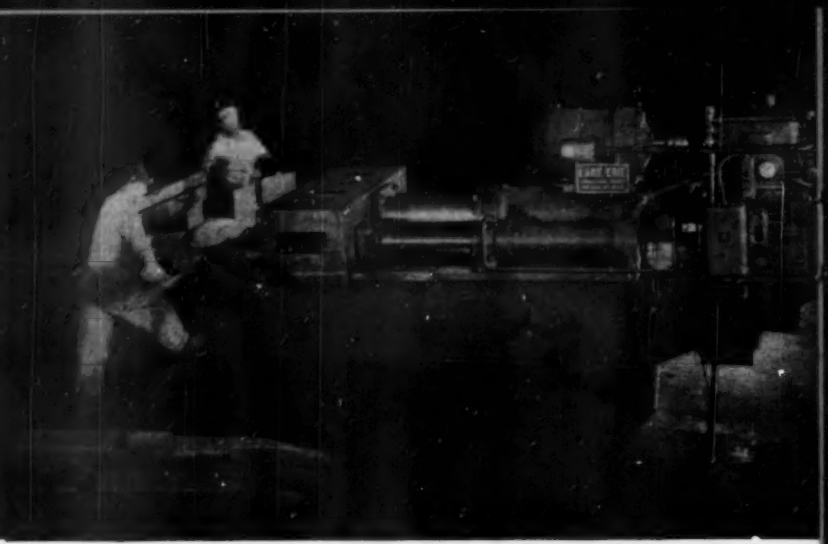
SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: DIVERSEY MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Distributor Representatives in All Principal Cities

ALLIS-CHALMERS

OPERATE TWO Bulldozers in the Springfield Works bending and forming frame members and other parts. Six more Lake Erie Bulldozers serve other Allis-Chalmers plants. Quality and uniformity of parts is better when they are produced with a hydraulic "squeeze." Lake Erie Bulldozer frames are heavy welded sections. Deflection under load is negligible and close die alignment is assured at all times.



HYDRAULIC BULLDOZERS SPEED PRODUCTION IN LEADING PLANTS

Used for hot and cold bending and forming operations—dies cost less... time is saved on set-ups... pieces are easier to handle... worker safety is increased.

The number and type of plants installing Lake Erie Hydraulic Bulldozers is an excellent indication of the many advantages of this new equipment. This improved combination of flexible hydraulic power and horizontal working of parts is enabling these plants to realize substantial economies and improvements in production. Lake Erie Hydraulic Bulldozers are available in a wide range of types and sizes for both standard and special applications. Let us know your requirements and we'll suggest a Bulldozer suitable for your particular needs. No obligation.

LAKE ERIE ENGINEERING CORP.

MANUFACTURERS OF
HYDRAULIC PRESSES AND SPECIAL MACHINERY

★

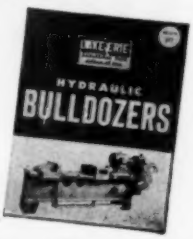
General Offices and Plant.

507 Woodward Avenue, Buffalo 17, New York

DISTRICT OFFICES IN NEW YORK, CHICAGO AND DETROIT

Representatives in Other Principal Cities in the United States and Foreign Countries

● Leading manufacturer of hydraulic presses—all sizes and types—metal working...plastics molding ...forging...metal extrusion...processing...rubber vulcanizing...stereotyping ...special purpose.

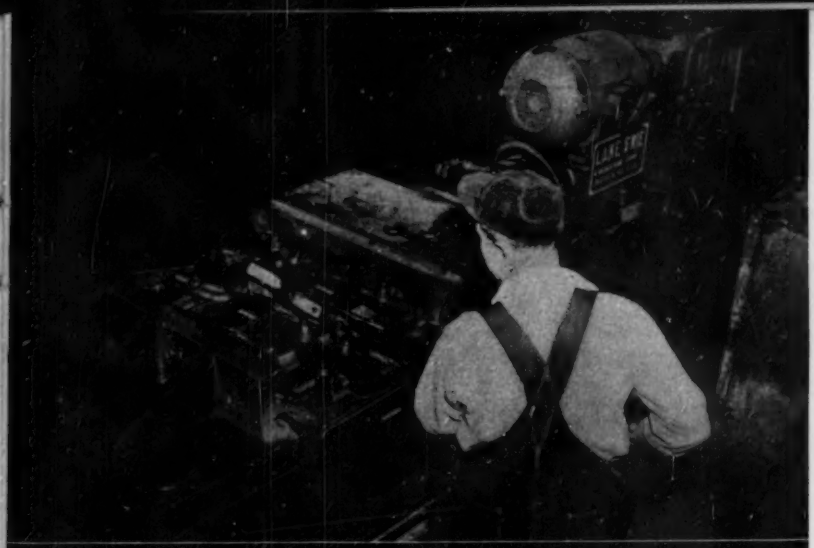


→ **WRITE** *for Bulldozer Bulletin*

Eliminate Production Shut-Downs Caused By Breakage Due To Overloading

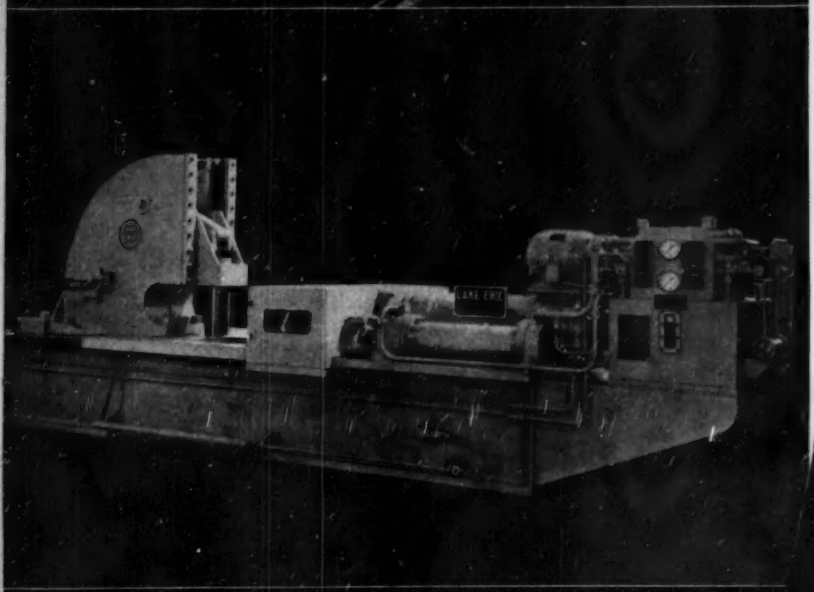
INTERNATIONAL HARVESTER

ALREADY HAVE two in operation producing main frames for mowers and rakes. Dies for Hydraulic Bulldozer use can be designed more simply and produced less expensively. Standard equipment on Lake Erie Hydraulic Bulldozers includes adjustable stroke stops, automatic adjustable pressure control on pumps, air and oil filters and pressure gages. Ways are hardened steel and are highly resistant to wear.



J. I. CASE CO.

HAVE THIS Lake Erie Bulldozer in their Racine plant. It is shown producing radius rod straps for tractors...one of its many production jobs. Any part of the stroke of a Lake Erie Bulldozer can be used with full pressure at any point. Hydraulic power and the control system employed simplify die set-up and change-over and eliminate the danger of breakage through overloading.



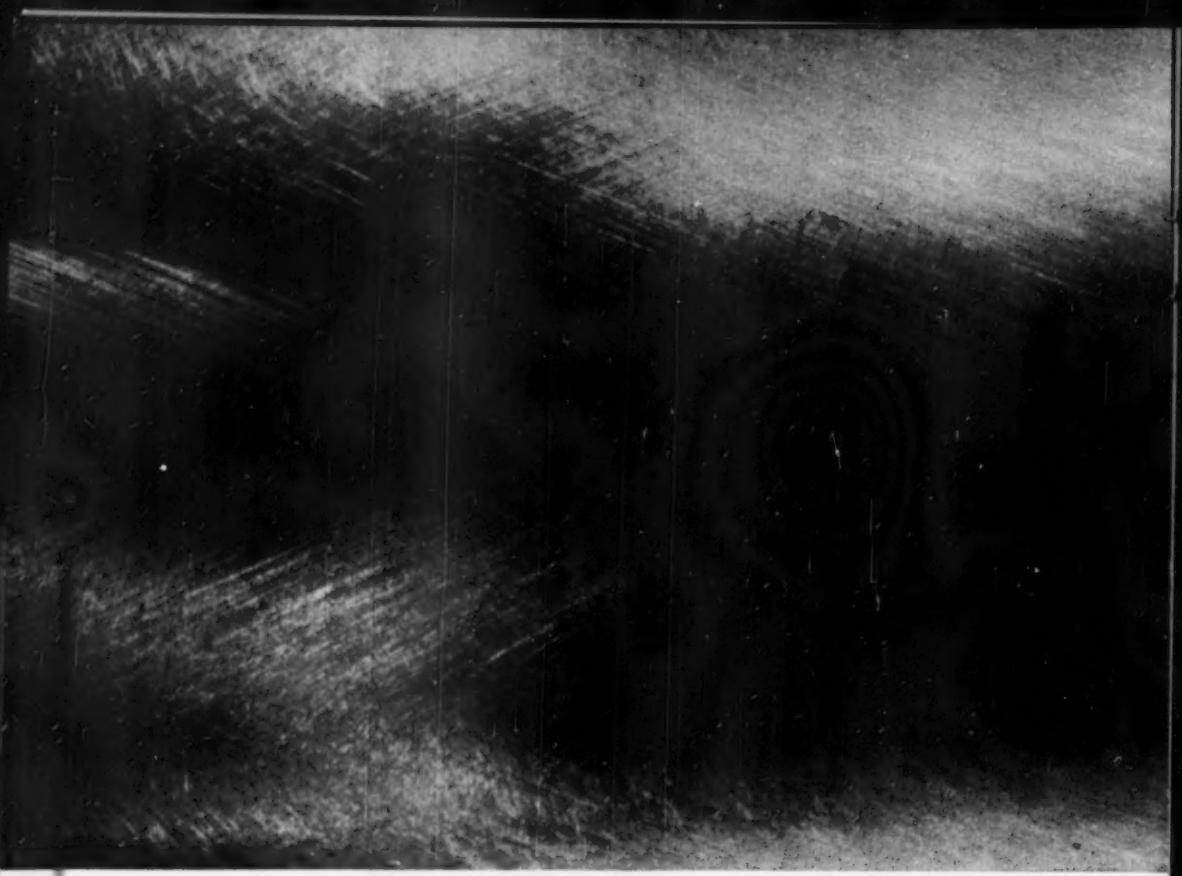
WESTINGHOUSE ELECTRIC

USE THIS standard model with both a standard head and a special ring forming head for producing motor frames. Lake Erie Hydraulic Bulldozers have double acting traverse cylinders that automatically speed the approach and return strokes and permit high rates of production. Lake Erie Bulldozers are compact, self-contained units that can be installed or moved if necesssary with a minimum of delay and expense.

LAKE ERIE
ENGINEERING CORP.
BUFFALO NY. U.S.A.

NORCOR

EMPLOY BOTH vertical and horizontal Bulldozers in the production of steel table frames and chair channels. Lake Erie Bulldozers are foot treadle operated. This leaves the operator's hands free to insert, adjust and remove work from the press. Pressure on treadle advances crosshead. Stroke can be stopped and returned at any point merely by releasing the treadle.



SUPERFINISH—*a money-saving process*

Cuts grinding costs 35% with this *"frosty finish"*

If you have thought of Superfinish as a process which adds to your cost, it's time to change your ideas. The "frosty" finish you see here is by no means beautiful, but it is just what the customer ordered—and it is giving him a better product at a 35% saving.

This is a crankshaft bearing for an Elgin Outboard Motor manufactured by the Hartford Division of the West Bend Aluminum Company exclusively for Sears, Roebuck and Company. The secret has been to alter the grinding operations. Rough grinding is now simplified and speeded up by using a free-cutting wheel. Finish grinding has been replaced by Superfinishing. Both operations are performed at the same production rate and the final finish is 10-12 Micro Inches.

In addition to the saving in manufacturing costs, there are certain quality advantages which must not be overlooked. Grinding peaks have been scrubbed away, leaving a firm bearing surface that requires no breaking in. Grinding chatter is no longer any problem, since the remaining roughness is all below the surface. The cross-hatch pattern of Superfinishing assures adequate distribution of lubricating oil throughout the bearing. It's a better surface—in addition to being less costly to produce.

Write on your company letterhead for a copy of the textbook "Wear and Surface Finish." It's mighty good reading.

GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN

GISHOLT

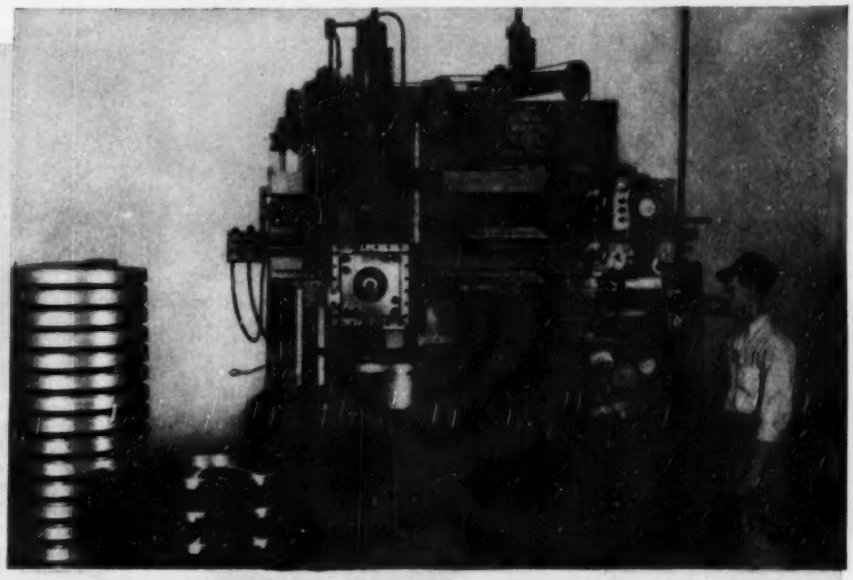
THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Savings in Hours

NOT JUST MINUTES

At the McNeil Machine and Engineering Company, Akron 11, Ohio, a Bullard 36" Man-Au-Trol Vertical Turret Lathe set production records.



The part illustrated is a Steam Platen Support being machined in 45 minutes compared to the Best previous method which required 3 HOURS. Time saved is based on 121 pieces.

Operations performed: Turn O.D. — face top and bottom of hub — bore and counterbore — underface arms.

Another set-up on the same machine resulted in machining a lot of 500 pieces (Crank Gear Blank) in 22 minutes per piece compared to 4¾ HOURS by the Best previous method.

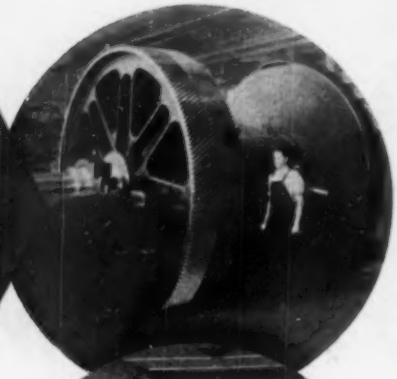
Operations performed: Turn O.D. — face both rim faces — face crank pin bosses — finish both top and bottom faces of hub — rough and finish bore.

Investigate Cost Savings with Bullard Man-Au-Trol V. T. L.

THE BULLARD COMPANY

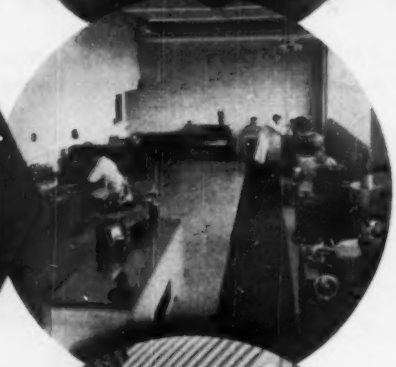
BRIDGEPORT 2, CONNECTICUT

UNIQUE FACILITIES



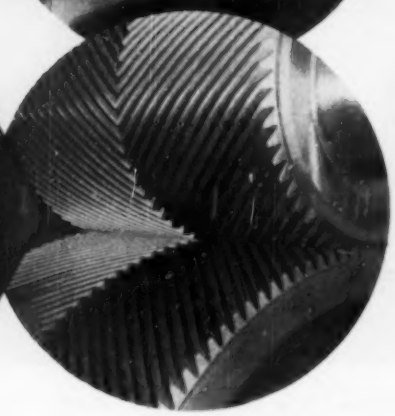
The famous *Gear with a Backbone* is made in the Buffalo plant of Farrel-Birmingham — a plant devoted to the design and manufacture of gears, gear units and gear generating machines. Here, seven of the largest gear generating machines in the world, plus numerous smaller ones, are used to cut continuous-tooth herringbone gears from "watch-fob" size up to twenty feet in diameter.

+ RESEARCH

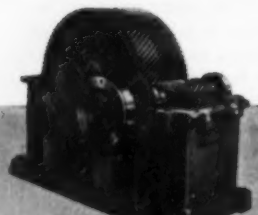


Advanced experimentation and exhaustive tests of gears are carried on in one of the most modern and fully equipped laboratories of its kind in the country.

= THE GEAR WITH A BACKBONE®



Because these gears have a *backbone*, instead of a useless center groove, the entire face width is put to work transmitting power. This provides extra strength and higher load-carrying capacity in smaller space — a definite advantage for many applications. Accuracy of tooth contour and tooth spacing, so vital to smooth, quiet operation, is inherent in the Farrel-Sykes method by which the teeth are generated.



FARREL® SPEED REDUCERS

Farrel speed reducers are available in a wide range of ratios and capacities. Designs include single, double and multiple reduction units; speed-change units; right-angle drives and drives to meet special requirements. The Gear with a Backbone, antifriction roller bearings, and heavy cases that prevent deflection and vibration are some of the features that insure maximum efficiency and smooth, quiet operation.

FB-564

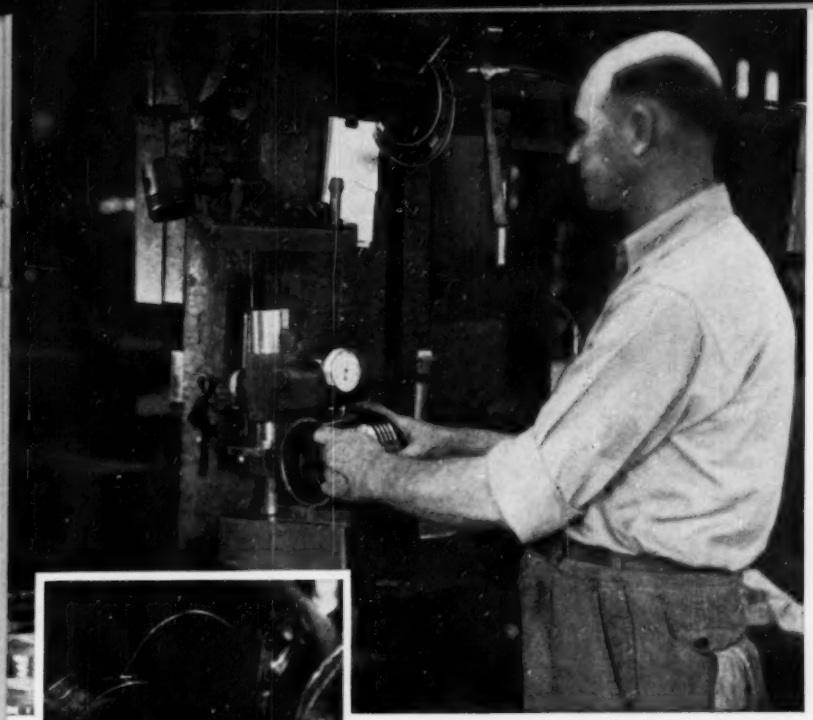
When you have a gear problem, think of Farrel-Birmingham. Information and engineering assistance are available at any time, without obligation.

FARREL-BIRMINGHAM CO., INC. • 344 VULCAN ST., BUFFALO 7, N.Y.

Plants: Ansonia and Derby, Conn., Buffalo, N.Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Cleveland, Detroit, Chicago, Los Angeles, Tulsa, Houston

Farrel-Birmingham ®



SUPERLA Soluble Oil

Gets double-barreled saving in piston grinding

The Job: Cylindrical grinding of cast-iron automotive pistons.

Machines: Six Norton Grinders.

Aiming at higher production and economy, a midwest plant tried various soluble oils on the job described above. Of the products tried, SUPERLA Soluble Oil proved superior to any and helped this plant reach its goal through these benefits:

Fewer wheel dressings—70 to 80 pistons are produced before wheels need dressing, as compared with an average of 30 to 40 pistons obtained with other soluble oils. This amounts to a big saving through reduced time and labor for dressing wheels.

Greater production—Less interruption for wheel maintenance adds approximately 40 minutes to the daily production time of each machine.

These additional advantages of using SUPERLA Soluble Oil are reported by the shop foreman: piston diameters kept within a tolerance of .0005 to .001 inch, no rusting troubles, no soluble-oil rancidity or odor troubles.

The experience of this plant indicates the savings you can make with SUPERLA Soluble Oil, not only on cast-iron jobs but on a wide variety of operations. Such product benefits, moreover, are multiplied by Standard Oil's engineering service which puts at your immediate disposal the help of an experienced lubrication specialist. How you as a midwest manufacturer can profit by this product-service combination is explained at the right.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

What's YOUR problem?

Whether your problem is one of obtaining greater production or higher product quality, there's a Standard Oil lubricant or cutting oil that can help you reach that goal. Moreover, there's a Standard Oil man who will work right with you until that goal is attained. This man is one in the corps of Standard Oil lubrication and cutting oil specialists throughout the Midwest. You'll find him at the nearest Standard Oil Company (Indiana) office. His experience and special training will help you get maximum benefits from such outstanding products as:

STANICUT Cutting Oils—These special-duty cutting oils meet today's most exacting requirements and highest production schedules. Grades varying in viscosity are available, each containing the correct proportion of extreme-pressure and anti-weld ingredients.

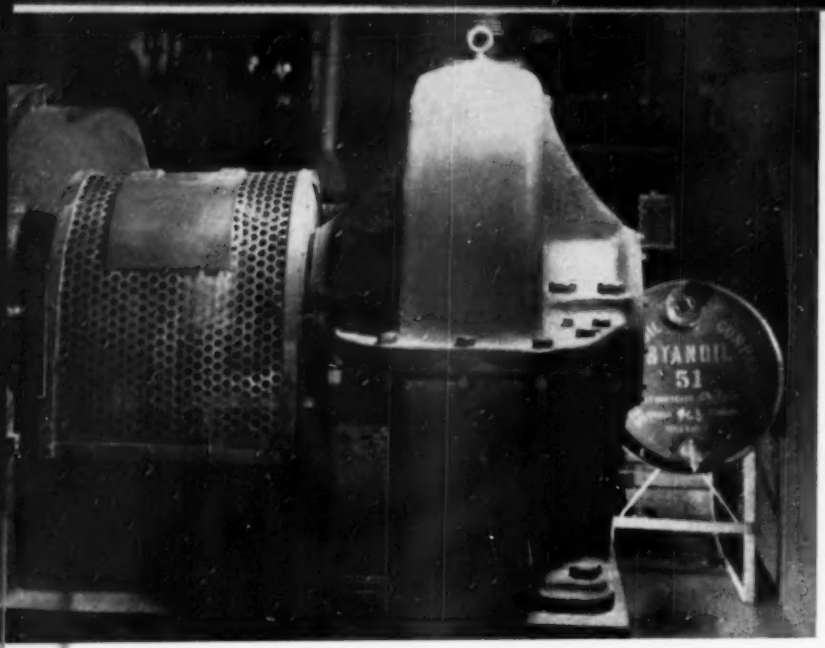
STANOSTAMPS—Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical application. STANOSTAMPS offer maximum protection for dies and work, can be readily removed in conventional washing equipment.

STANDARD Quenching Oil—From Standard Oil's complete line of quenching oils, this product is recommended for general quenching work in systems provided with suitable cooling arrangements. It is a light-bodied oil of pale color that offers high quenching speed and minimum deterioration in continuous use.

STANOIL Industrial Oils—This multi-purpose line of oils provides cleaner operation of hydraulic units, supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

SUPERLA Greases—Available in lime soap and soda soap types, SUPERLA Greases cover a wide range of applications. These products are comparable in quality to the highest type of special greases but are as readily available and economical as ordinary cup greases.

STANDARD OIL COMPANY (INDIANA) STANDARD



Arrest the dirty work in reduction gears

THE dirty work starts in reduction gears when the lubricating oil begins to oxidize and break down under the attack of heat and air. Oxidation products, uniting with dust and other foreign matter, form deposits which interfere with proper lubrication and cause gear wear.

STANOIL
TRADE MARK
Industrial Oil

You can head off this dirty work—avoid costly cleaning jobs, oil changes, and gear wear—by using STANOIL Industrial Oil. The high stability of STANOIL prevents deterioration by heat. Its low-carbon-forming base oil keeps gears free from carbon. An inhibitor curbs acidity growth which would cause the formation of emulsions and sludge.

The many qualities of this one oil enable it to handle a wide variety of jobs in your plant. To assure you maximum benefits from STANOIL and other high-quality petroleum products, the Standard Oil Company has a well-trained and experienced lubrication specialist located practically at your doorstep. How you can profit by this unique product-service combination is explained at the right.

Standard Oil Company (Indiana), 910 S. Michigan Avenue, Chicago 80, Illinois.

What's YOUR problem?

● To help you solve particular lubrication problems or gain greater all-around economy, Standard Oil has set up an industrial service that's unrivalled in the Midwest. This service puts at your immediate disposal the help of a highly trained, experienced lubrication specialist and a reliable supply of petroleum products. All you need do is phone or address a card to the nearest Standard Oil Company (Indiana) office. In fact, why not start right now by arranging for the visit of the lubrication specialist assigned to your plant. With his help, find how many different oils in your plant can be replaced by STANOIL Industrial Oil on such applications as:

Hydraulic systems...cleaner operation, no foaming troubles.

Air compressors . . . no sticking or clogging of valves, less oil consumption in splash or circulating systems.

Speed reducers . . . less wear of gears and bearings during frequent cold starts or prolonged high-temperature operation.

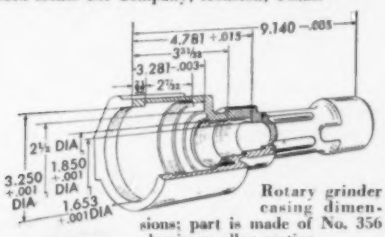
Steam turbines . . . freedom from emulsions and sludge, fewer oil changes necessary.

Ring-oiled bearings . . . rings function immediately on starting, less bearing wear.

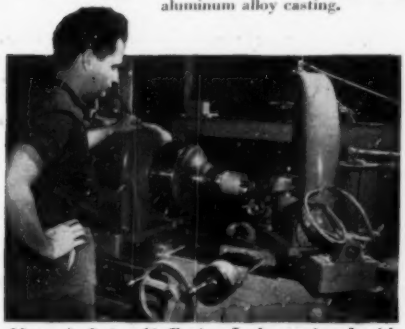
Circulating and bath systems ...one oil for a wide variety of jobs.

STANDARD **STANDARD OIL COMPANY (INDIANA)**

Battery of 3 Monarch Series 60 Engine Lathes, "Air-Gage Tracer"-equipped, producing rotary grinder casings in the Cleco Division plant of the Reed Roller Bit Company, Houston, Texas.



Rotary grinder casing dimensions; part is made of No. 356 aluminum alloy casting.



Monarch Series 60 Engine Lathe equipped with "Air-Gage Tracer", turning rotary grinder cases at Reed Roller Bit Company. Operations include rough and finish inside diameters, faces, chamfers, undercuts and reliefs. Cemented carbide tools used.

Picture of PRODUCTION

3.75 times faster

Air-Gage Tracing has cut 16.42 minutes off the time for machining these rotary grinder cases. On a turret lathe they took 22.42 minutes each; now they're roughed and finished in a total of 3.70 minutes—and handling and gauging time adds another 2.30 minutes—6.00 minutes in all, complete!

There's a saving on tools and tool sharpening, too. On the turret lathe, hand reaming was necessary, using four reamers. The "Air-Gage Tracer"-equipped Monarch Series 60 Lathe does the job with such accuracy and fine finish that no reaming is needed.

For similar savings in your own contour turning, boring and facing—or step shaft production, investigate the stepless, single tool Monarch "Air-Gage Tracer" attachment. It is applicable as factory equipment on all lathes in the Monarch line.
Ask for Bulletin 2604.

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

FOR A GOOD TURN *FASTER*—TURN TO MONARCH

NIAGARA

The performance of Niagara Knives is the result of long experience in manufacturing not only knives but the shears upon which they are used. Niagara Knives are made in the Niagara Plant with every step including design, metallurgical specifications, heat treating, grinding and inspection under Niagara control. They are made in single and four cutting edge solid steel, laid steel and high speed types. Alloys and heat treat characteristics to suit every shearing need.

NIAGARA FACTORY REGRINDING SERVICE

Take advantage of Niagara factory regrinding service by the same skilled men and on the same precision machines used in making Niagara Knives.

Each Niagara Knife is reground in accordance with its own metallurgical and heat treat characteristics as recorded by serial number at the factory.

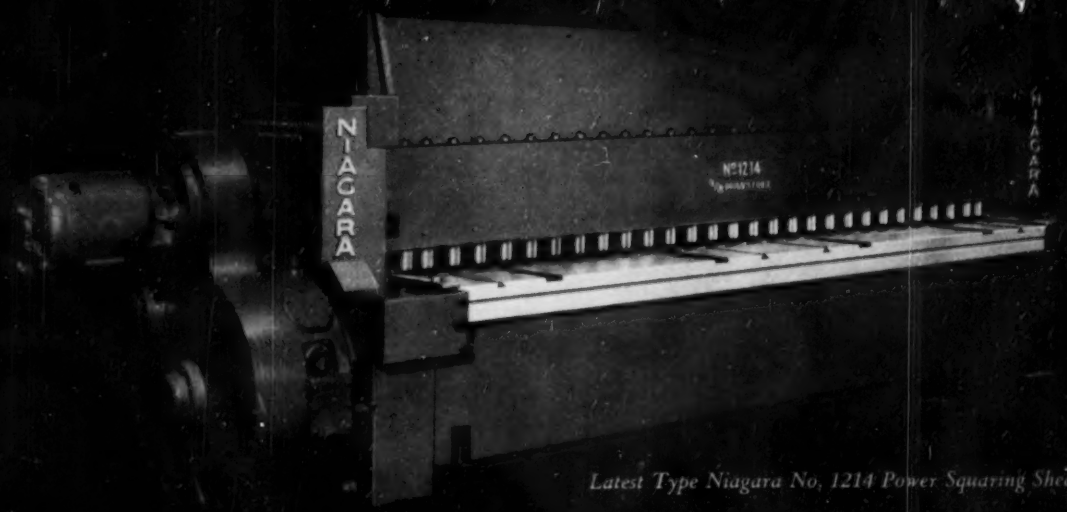
Prolong the life of your knives by having them reground by Niagara factory methods rather than by improvised methods.

NIAGARA MACHINE AND TOOL WORKS · BUFFALO 11, N. Y.

KNIVES

MADE BY THE MANUFACTURERS *of* POWER SQUARING SHEARS

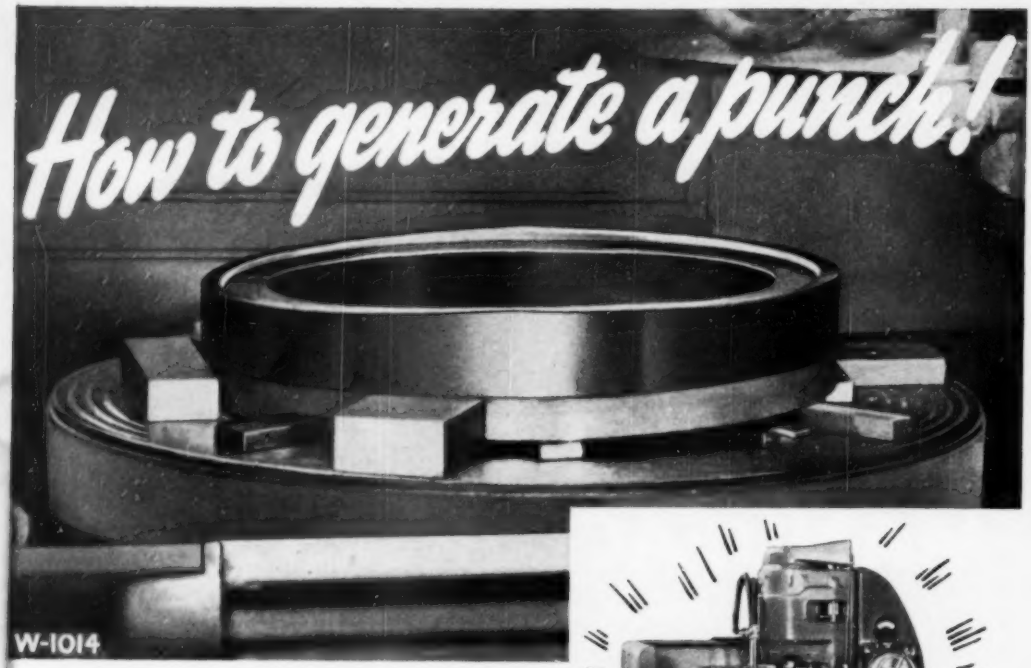
Manufacturers of Presses, Shears, Machines and Tinner's Tools for plate and sheet metal work



Latest Type Niagara No, 1214 Power Squaring Shear

DISTRICT OFFICES: NEW YORK, CLEVELAND, DETROIT

How to generate a punch!



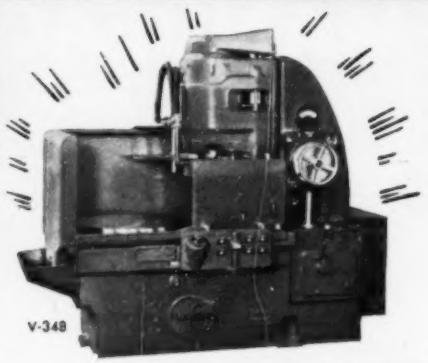
... Put it on the BLANCHARD

Obviously this is no ordinary surface grinding job—and obviously the Blanchard No. 18, with tilting wheelhead column, is the right machine for the job.

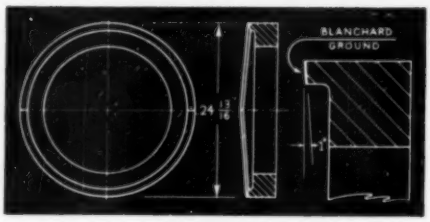
Duplicate circumferential and radial shear reliefs are generated in two set-ups on this 24 13/16" punch. Resharpening operation takes approximately 45 minutes.

Each portion is ground by the following method. The punch is centered on the magnetic chuck, and wedged to raise one side to obtain proper circumferential shear. The wheelhead is then tilted to a predetermined angle. A normal grinding operation generates the specified shape on one half of circle.

Blanchard is in a unique position to help you solve surface grinding problems that may look difficult or impossible —by methods that prove easy and profitable. Send samples or prints for free production estimates.



NO. 18 BLANCHARD SURFACE GRINDER

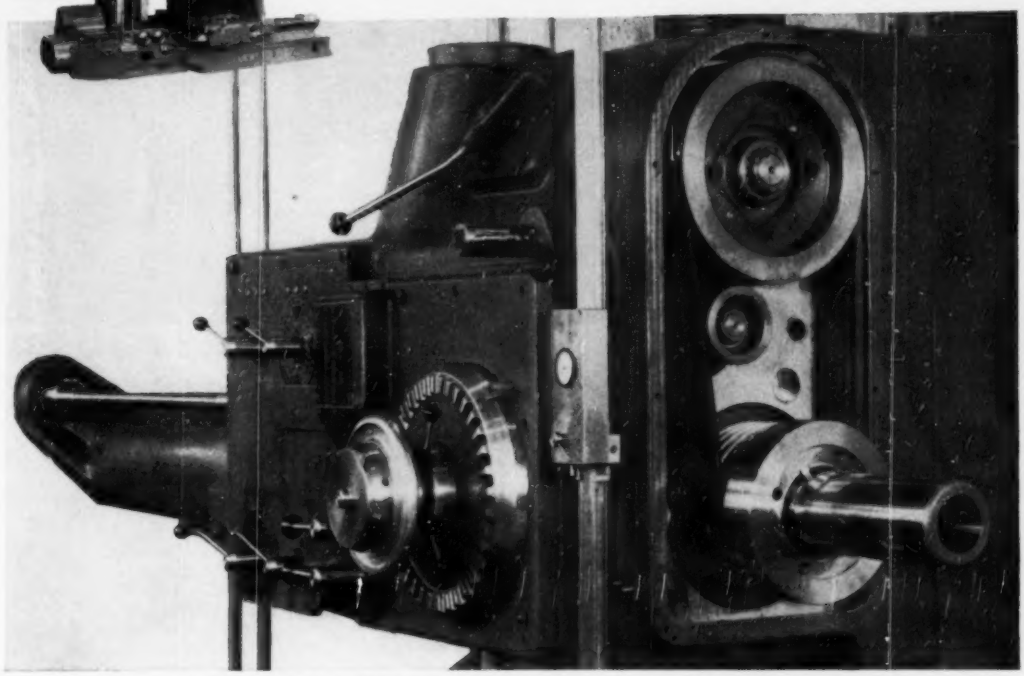


Send for free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD **THE BLANCHARD MACHINE COMPANY**
64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

▶Time-saving single spindle
▶Vibration-free drive at high speeds

. . ONLY LUCAS HAS IT



SINGLE SPINDLE—Lucas Precision horizontal boring, drilling and milling machines incorporate three speed ranges to a single spindle. The low range is through a gear of larger diameter than the largest milling cutter normally used on this machine. The intermediate range is also gear driven, while the high speed range drives through multiple V-belts directly to the spindle sleeve.

VIBRATION-FREE DRIVE—In the high speed drive through the multiple V-belts, the integral low and intermediate heavy rim gears mounted on the spindle sleeve are out of mesh and act as a flywheel to produce a vibration-free drive for carbide tools.

The operator can change from one speed to another by a convenient lever mounted on the spindle head. With the full speed range available on the single spindle, the operator can perform operations of drilling and boring at proper speed with one setting of the spindle head.

Wherever they are in service, Lucas Precision horizontal boring, drilling and milling machines accomplish basic savings in tools and time. Their versatility is so great that they are kept in practically constant use.

Built in 3", 4", 5" and 6" spindle models, all available with Automatic Power Positioning which eliminates jigs and fixtures and makes the horizontal boring machine a highly accurate production machine. Work ranges from 36" x 36" to 96" x 120". All sizes furnished with either two-way or four-way beds. Write for descriptive literature.

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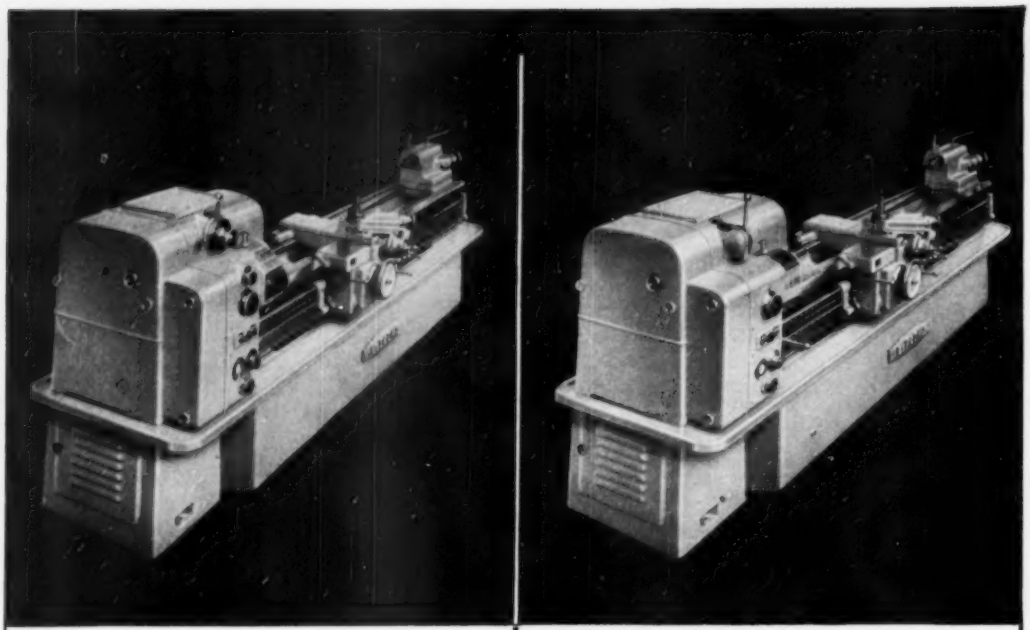
HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO



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Tool Room Lathe with over 300
spindle speeds 6 to 1500 rpm
obtained through variable speed drive.

16" LeBlond Model RT
Heavy Duty Engine Lathe
with 16 spindle speeds
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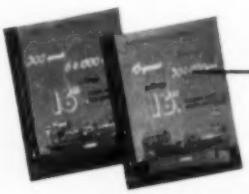

for complete information

see our catalog in Sweet's File for the Mechanical Industries, or send for bulletins RT-31 and HD-30-A.

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LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES.
SALES OFFICES: New York, Chicago, Detroit.

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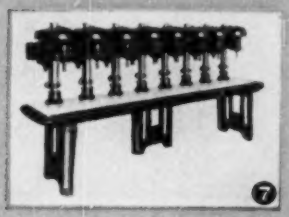
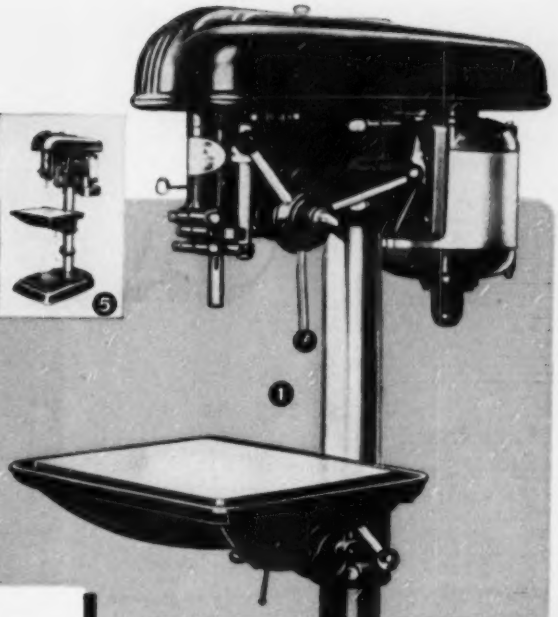

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That's why it pays to select the *right* drill press for your job from *the complete Delta line.* The same goes for other metalworking and woodworking tools — see Delta first!

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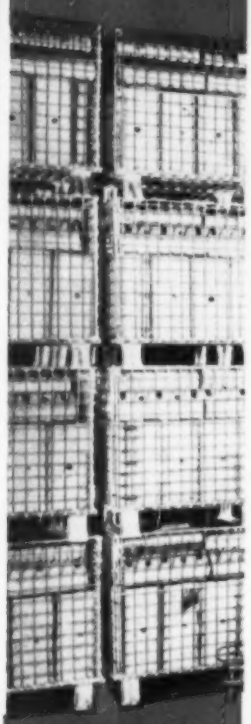
Pittsburgh CARGOTAINERS



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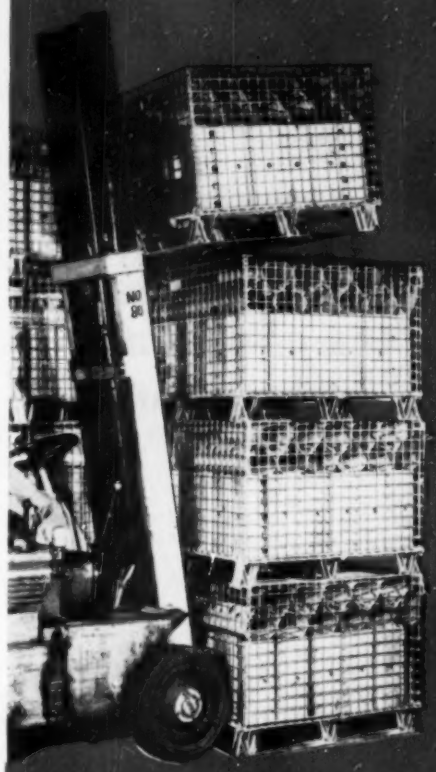
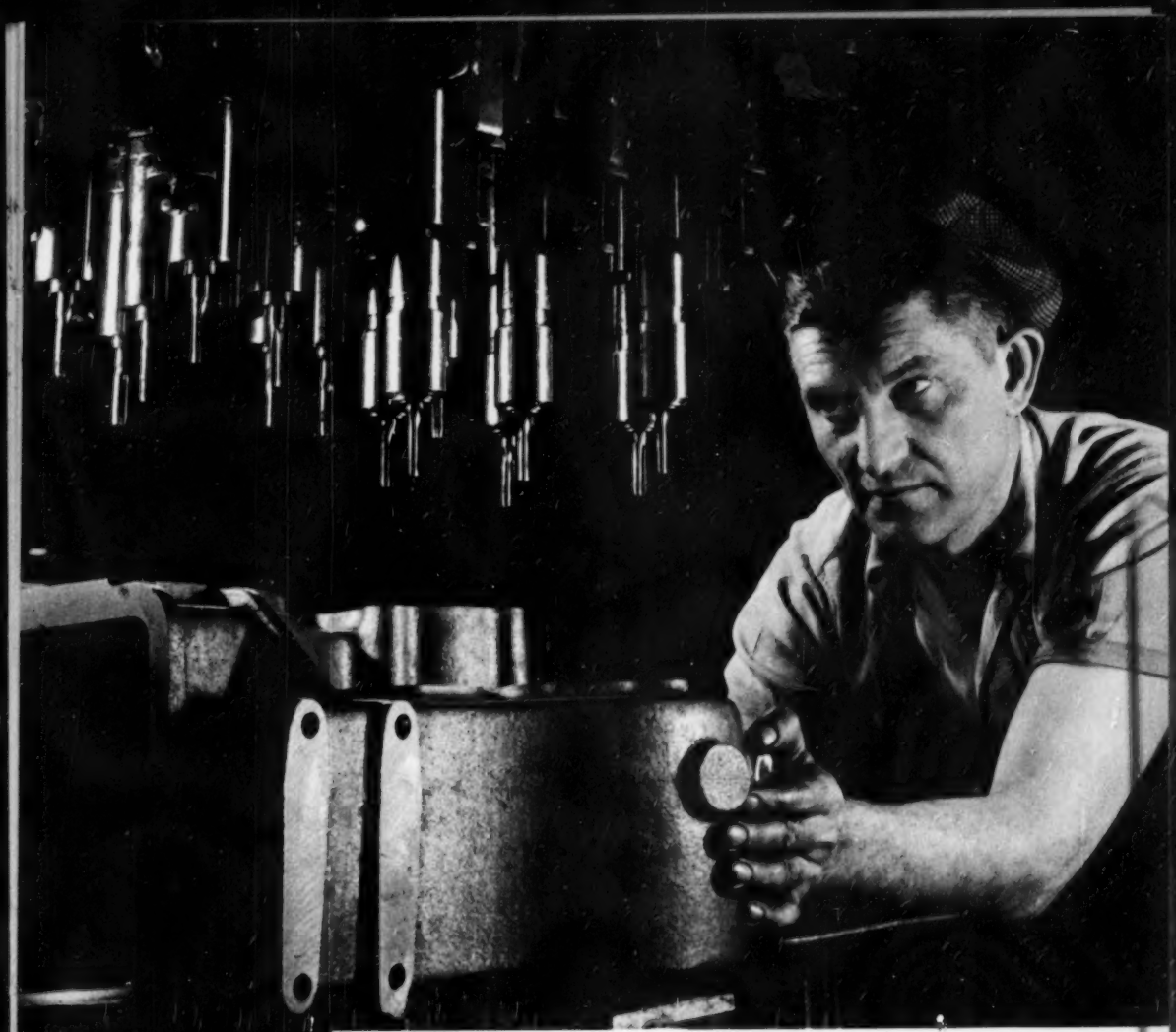
Handling with Cargotainers, as parts from production line go directly to **storage** or shipping dock. Inventory is easy—items accessible at all times. **Shipping** costs are reduced. There is no re-handling of parts. Fork truck delivers from receiving dock to **assembly line.** Use Pittsburgh Welded Wire Cargotainers—they fold, save space, time and money. Write Department AM.



Pittsburgh Steel Products Company

A Subsidiary of

Pittsburgh Steel Company, Pittsburgh, Pa.



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When this operator pushes the button to make contact between these taps and the complicated casting he is about to thread, he will risk a huge investment in machinery and semi-finished product. For a fleeting moment the management, labor and engineering skill that made this cost reducing set up possible is completely dependent on the performance of these taps. A tremendous responsibility is theirs.

But with GREENFIELD TAPS in the spindles, this man will push the button with confidence.

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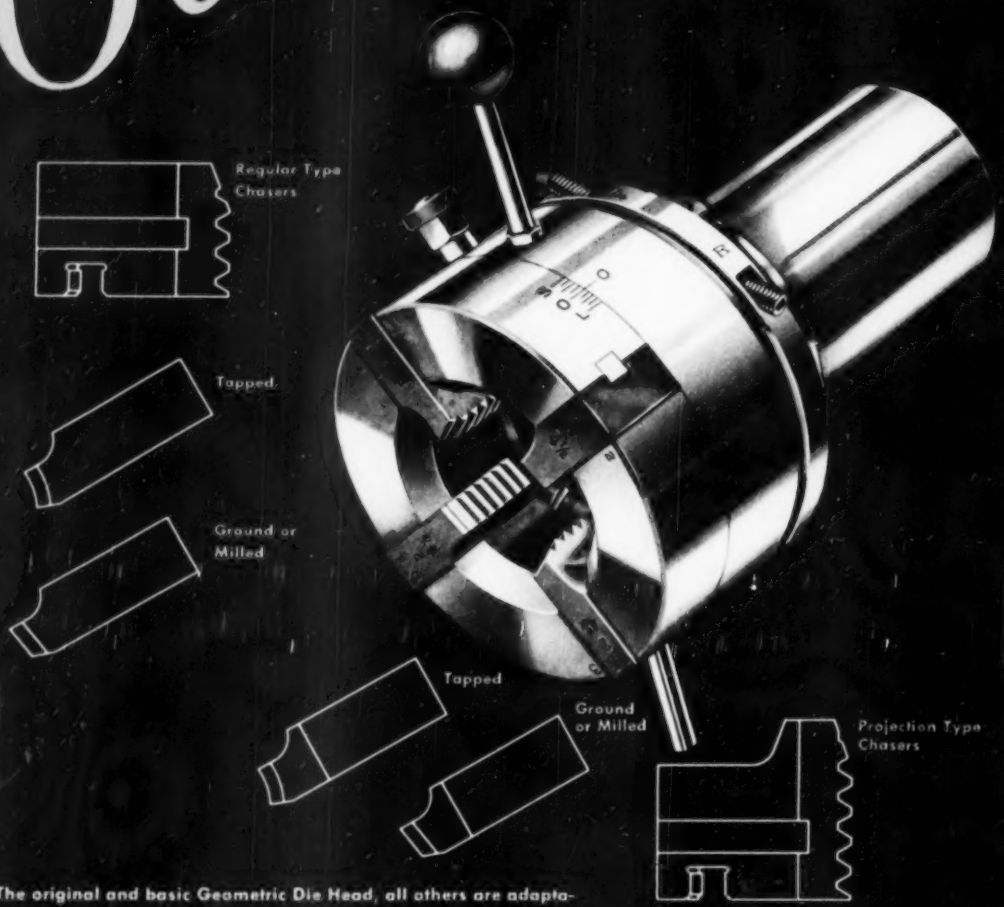
BUY *GREENFIELD* TAPS

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

Geometric "D"

INDUSTRY'S BASIC DIE HEAD



The original and basic Geometric Die Head, all others are adaptations of it. Simple, compact, sturdy and above all reliable, style "D" is the standard of comparison for all other styles or makes.

Furnished in Stationary style only in seven head sizes with a cutting range of ⅛" to 3½" NC and NF.

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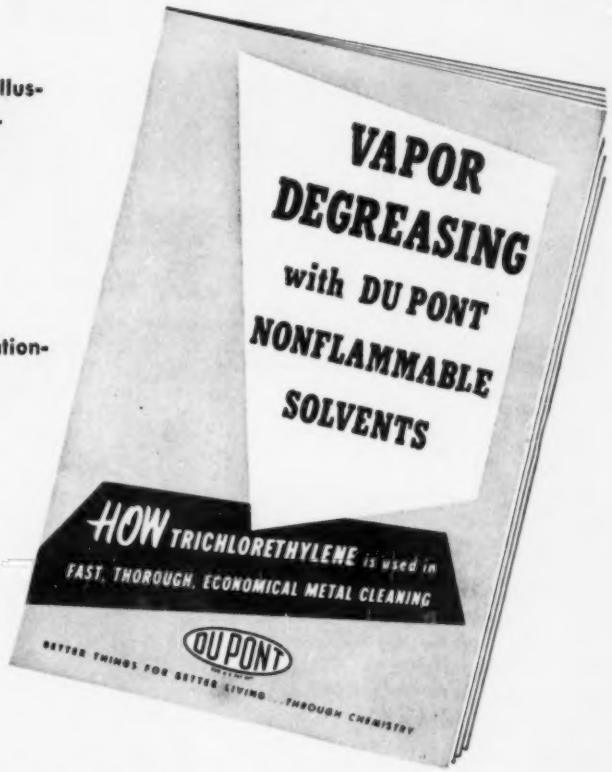
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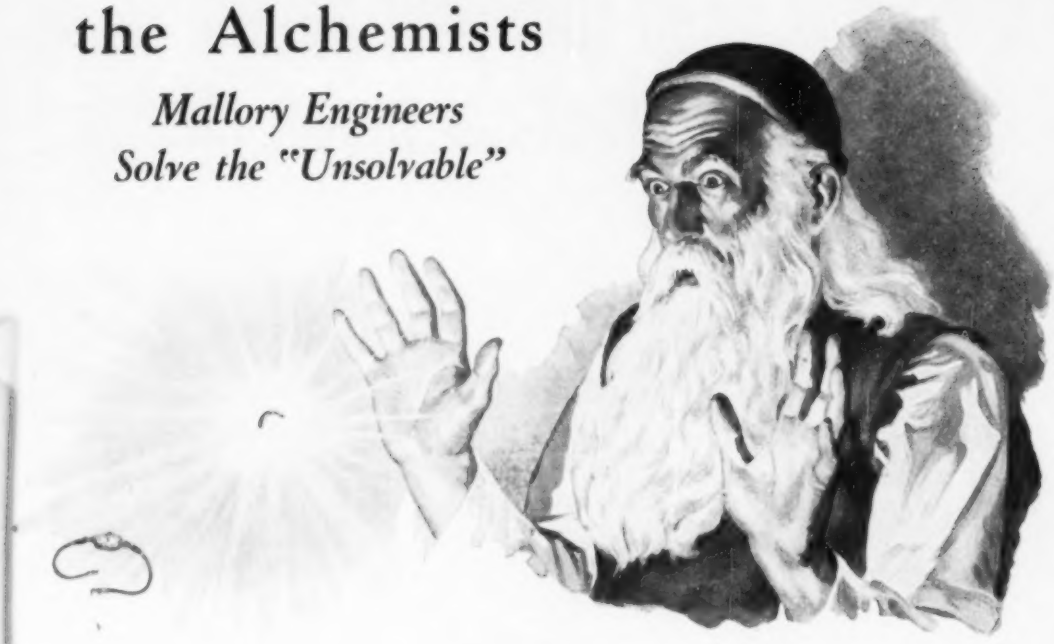

A dependable self-winding wrist watch in small, sleek design had been the dream of designers for years. But one tiny piece of metal—a pendulum that winds the spring—was the barrier they could not hurdle.

Brass or steel pendulums were so bulky that watch movements were cramped for space and stylized cases were out of the question. A *concentrated* weight—a *high density* metal was needed. Lead lacked strength; gold and platinum were too expensive.

Then Mallory metallurgists were invited to tackle this problem. As has happened in so many other tough cases, Mallory found the solution! It was Mallory 1000 High Density Metal. On every count, Mallory 1000 Metal came through with flying colors:

Twice as dense as brass or steel, half again as dense as lead, the Mallory 1000 watch weight could be so small that the size of the case could be substantially reduced and still allow room for sturdy movements.

It was readily machinable, strong as steel, had high resistance to corrosion and was non-magnetic.

Thus Mallory opened the door to compact design in a factory-sealed watchcase that was dust and moisture proof.

As you see these new watches come on the market, it will pay you to remember the high density metal—Mallory 1000—that made the whole idea "tick". It will pay you to look further into the wide range of special Mallory metals and alloys and see how they may help you in your modern design problems.

Mallory engineers will be glad to consult with you, and give you benefits of their knowledge and experience in applying Mallory special metallurgical products to your designs. Ask Mallory first.

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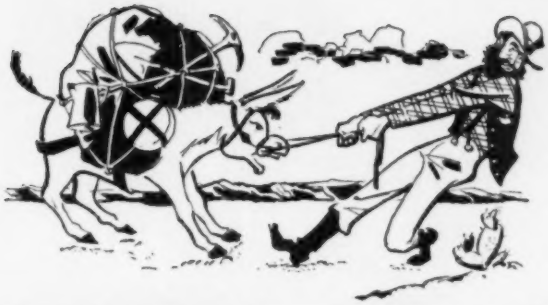

Why Struggle with Poor Equipment?

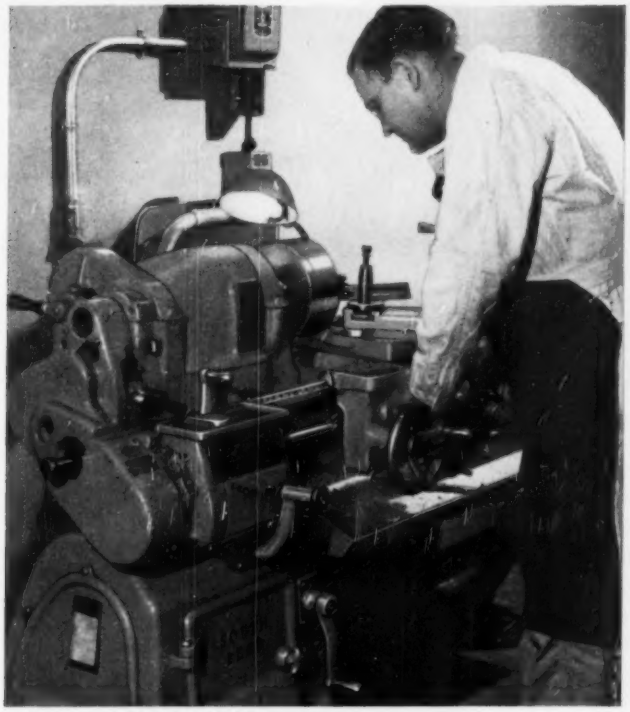

Photo courtesy of Trans World Airlines

13" x 5', 1" COLLET, QUICK CHANGE GEAR LATHE With Switch and 1 h.p., 3 phase, 60 cycle, 220 volt Motor; f. o. b. factory $1227.25*

Time Payments: $307.25 down, $81.26 for 12 months

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Close tolerances come without a "fight" on a South Bend Lathe. Regardless of the operation you'll find that you can get exact dimensions every time without slowing up. It's another example of "quality counts". You can always depend on a South Bend to turn out better work. It's built right — it's accurate, versatile and easy to operate. In the long run, it will actually cost you less for you get more and better service.

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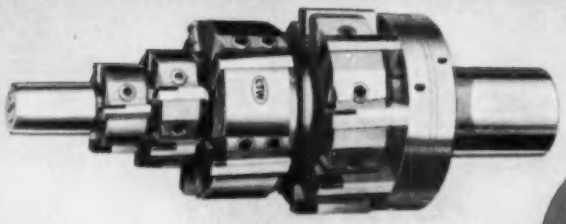
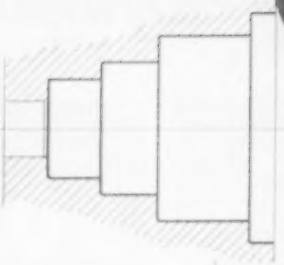
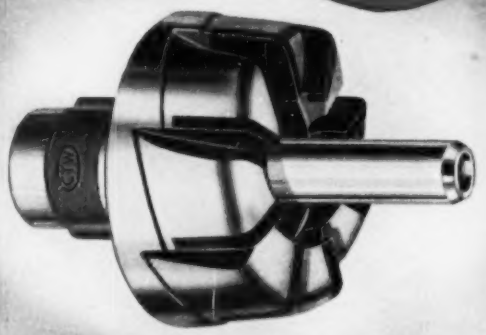


Need Special CUTTING TOOLS?

Continental special cutter with carbide tipped inserted blades has a roller pilot which guides the tool as it finishes four concentric diameters and four shoulders. The drawing shows the cuts in heavy lines





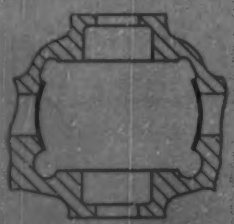
CONTINENTAL

DESIGNS THEM TO SUIT YOUR NEEDS EXACTLY

Those high production jobs that have to show a profit are everyday problems at Continental. The Continental Cutting Tool Division of Ex-Cell-O designs and manufactures all the special cutting tools that are used in the Ex-Cell-O Organization. Continental Tools of all types are used day after day on gruelling production work that must pass rigid inspection and must be done at a profit.

Whether the job calls for high-speed steel, cast alloys or carbides, Continental can supply the tools to suit the job *exactly*. The new Continental Tool Catalog shows hundreds of cutting tools, standard and special, and broaches. If you haven't received a copy write for one today on your company letterhead. And for special tools just send a tool print or a part print showing operations to be performed and ask for a quotation.

This special Continental tool taper reams, forms a radius and hollow mills. Operations are indicated in heavy lines in the drawing.



Continental double-end carbide tipped spherical cutting roller used in a special machine for finishing two inside surfaces of automotive differential cases.

50-19

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

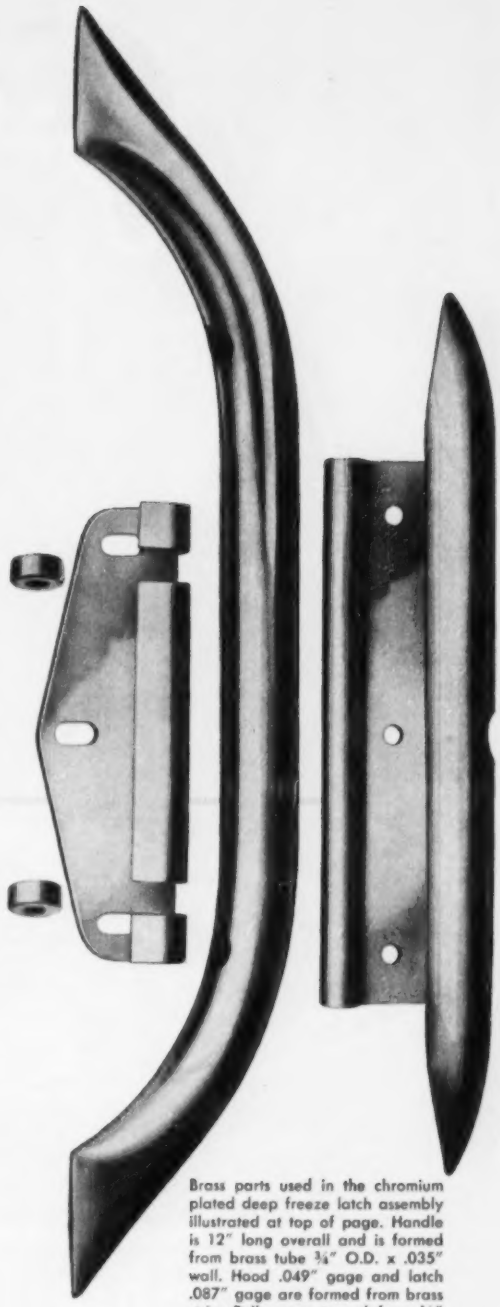
DETROIT 32, MICHIGAN

SHORT, SHORT STORY:

1. Latch assembly on deep freeze cabinet was made of steel.
2. Parts rusted—plating peeled—owners complained.
3. "Covert" switched to brass—saved customer 30¢ a set.
4. Better product—no complaints—everybody happy.

IT'S AS SIMPLE AS THAT. Cost of the brass (weighing less than a pound in the finished parts) was higher. Fabricating cost and procedure were exactly the same. However, the cost of buffing the 70-odd square inches of exposed area, before plating, was cut in half and this, plus the elimination of rejected parts, effected a net saving of 30¢ per set over the extra cost of the metal.

This happened to the Covert Manufacturing Co., Troy, New York. It could happen to you. We'll be glad to talk it over. . . . Address The American Brass Company, Waterbury 20, Connecticut; in Canada, New Toronto, Ont.



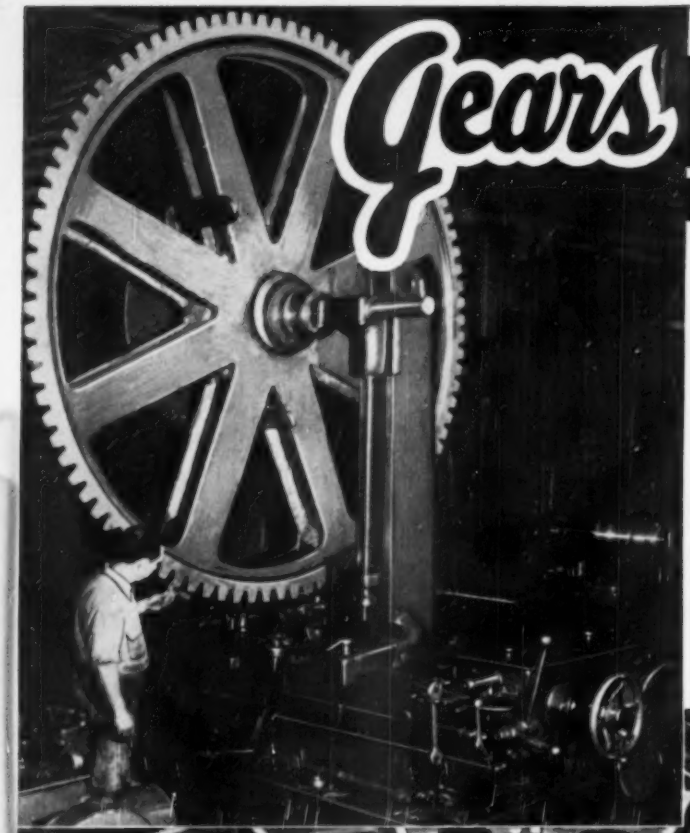
Brass parts used in the chromium plated deep freeze latch assembly illustrated at top of page. Handle is 12" long overall and is formed from brass tube ¾" O.D. x .035" wall. Hood .049" gage and latch .087" gage are formed from brass strip. Rollers are turned from ½" diameter brass rod. 6067

ANACONDA

the name to remember in **COPPER, BRASS & BRONZE**

P.S. *Chromium plating on brass is brighter . . . less costly . . . longer-lasting*

Gears LARGE ...ANY TYPE



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Industrial Gears and Speed Reducers
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COATED PRODUCTS COMMENTS

Belt grinding production doubled, unit cost cut

Production increases of as much as 30-50-100% and more are not uncommon when CARBORUNDUM's Industrial Cloth Belts are used to grind either high or low tensile strength metals. There's the shovel manufacturer who increased the number of shovel handles per belt from 960 to 1260 units. Or take the plant that is polishing stainless steel tubing at ½¢ per foot now where 7¢ per foot was the former cost, by another machine. These cases are representative of hundreds of others where CARBORUNDUM's cloth belts are credited with increased production and lower unit cost.

The reasons behind this belt performance are the long grinding service of sharp cutting ALOXITE aluminum oxide grain and the stretch resistant, heavy duty cloth backing treated to withstand the most severe operations. Add to this the heat resistant bond and you have an abrasive belt combination that is hard to match. Coated Products Division, The Carborundum Company, Niagara Falls, New York.

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Making ALL abrasive products . . . to give you the proper ONE

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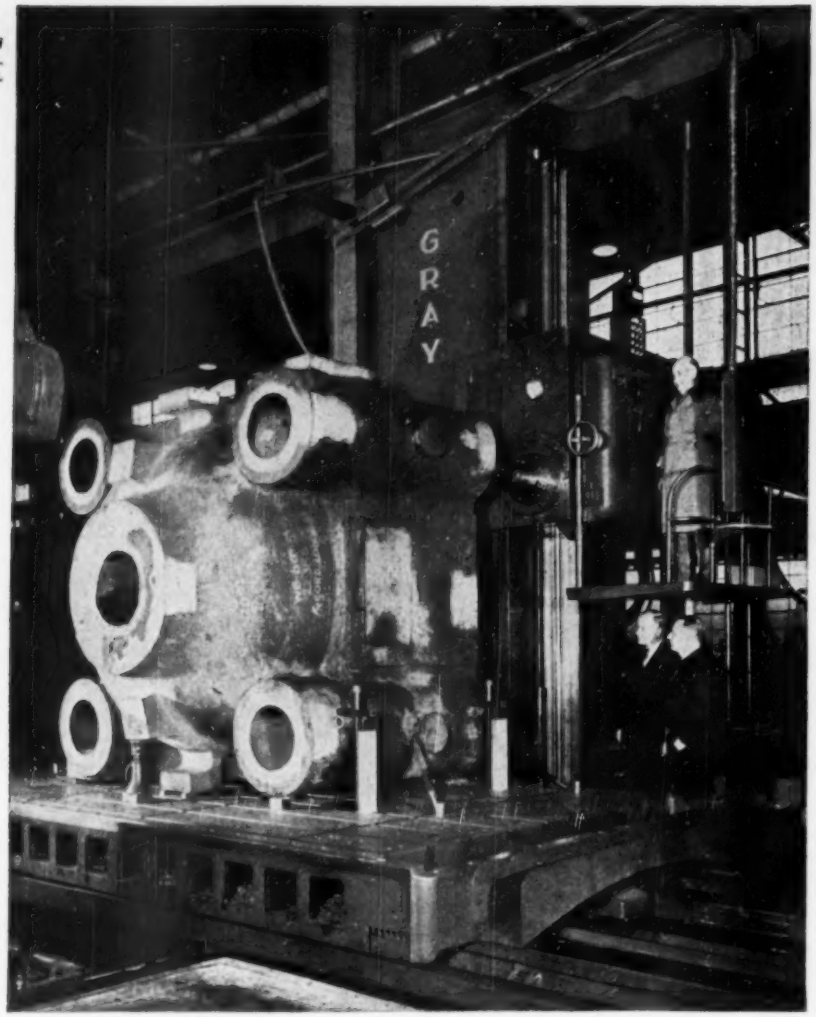
Photograph courtesy of Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.



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Today's highly competitive markets demand the best work at the lowest cost. Powerful, efficient, modern GRAY Boring Machines answer this challenge and will do your work BETTER at LOWER COST.

The G.A. GRAY Company

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horizontal boring machines

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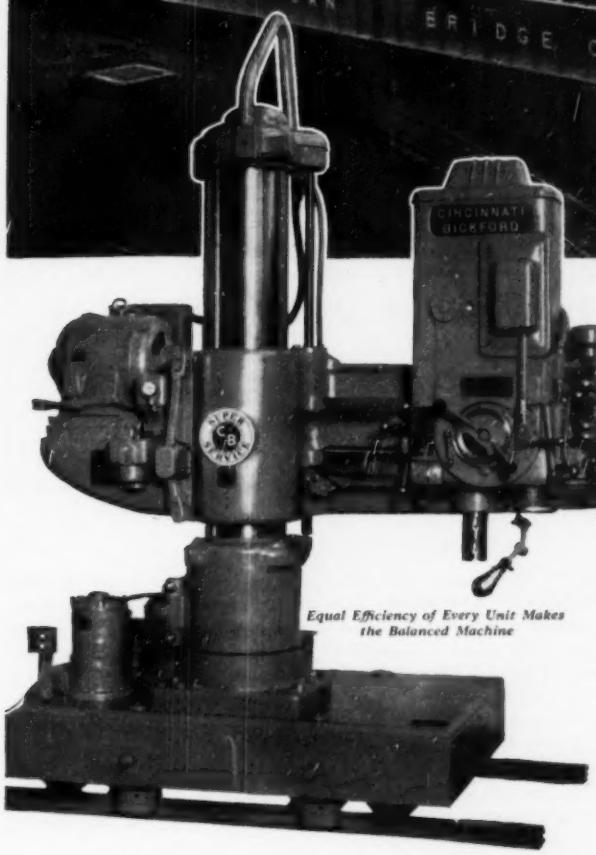
DRILLING LARGE WORK?*



Equal Efficiency of Every Unit Makes the Balanced Machine

* Move the machine!

At the American Bridge Company, a U. S. Steel Corporation Subsidiary, drilling many large and cumbersome parts, this CINCINNATI BICKFORD SUPER SERVICE 5′ arm 13″ diameter column Radial with bailing hook on column, is mounted on a 36″ gauge track type base. To speed operations, this machine is equipped with dual controls for traversing and clamping the base. One set is mounted on the base and the other on the head of the machine. For further information, write for Bulletin R-29.

Shipped on five flat cars, the 162′ 150 ton span is the largest completely assembled continuous deck girder span ever shipped by the American Bridge Company, and its fabrication was speeded by the use of two track type base Cincinnati Bickford Super Service Radials.

Good judgment in selecting the proper machines, tools, and fixtures will consistently produce the best manufacturing results. Our CUSTOMER PRODUCTION ENGINEERING SERVICE in the metal drilling field represents the collective experience of many years (since 1874). Make your problems ours - - let us show you a profitable Radial or Upright Drill production application. Your most urgent production problems warrant our immediate attention.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES
Radials 7½″ dia. col., 2½′ arm, to 26″ dia. col., 12′ arm.
General purpose Uprights, 21″ to 28″ sizes.
Production Uprights, 21″ to 28″.
Jig Borers, Portable Horizontals, Spacing Table Machines

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio

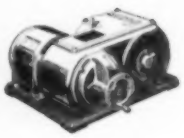
"..... and then, at this point, we installed Reeves Speed Control."

THE 3 BASIC REEVES UNITS

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

VARI SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 10 hp.

MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 20 hp.



Applied to your production machines, accurate, instantly variable REEVES Speed Control will produce results—*right now!* You'll see *immediate,* dollars-and-cents improvement in rate of production, quality and uniformity of product . . . *immediate* reduction in time and material loss. All because REEVES Speed Control, by providing the correct speed for every operation and every operator under every changing condition, enables both machines and men to work at top efficiency. More than 265,000 REEVES installations encompassing virtually every industry prove this statement *beyond the shadow of a doubt!* Prove it to yourself. Install REEVES on existing machines—demand it on new ones. Write for the new, 132-page catalog covering in detail the complete REEVES line. Ask for Catalog No. A31-3N.

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Recognized Leader in the Specialized Field of Speed Control Engineering

ACCURATE • VARIABLE

Reeves Speed Control

GIVES THE RIGHT SPEED FOR EVERY JOB!

SPOT NEWS of Metalworking

- **Phantom orders for hydraulic and mechanical presses** will go out next fall to press builders as part of National Security Resources Board's war planning. They will be followed by orders for industrial fans and blowers, anti-friction bearings, fractional motors and industrial furnaces in early 1951. Late this year NSRB will revise upward its estimates of machine tool needs, which now stand at 290 orders for about 100,000 machines valued at $800 million.

- **Canadian machine tool builders have asked their government** to prohibit import from Britain as well as from other countries of machine tool types made in Canada. Request is result of drive being conducted in Canada for business by British companies which will culminate in extensive exhibits of British machine tools at Canadian Industrial Fair at Toronto in June.

Small experimental atomic power plant will be running within 2-3 years at General Electric's Knolls Laboratory at Schenectady. Harry A. Winne, GE vice president states, however, that little of world's power supply will come from nuclear fuel in next generation.

- **Gas turbine engine for road vehicles,** made by Rover Co., British automobile maker, has just completed road tests. Several Rover engineers were associated during war with Sir Frank Whittle in jet engine developments. Other British companies are working on gas turbine or rotary automobile engines which they hope to bring out this year or next.

- **There is no wage pattern to contract settlements** reported to Bureau of Labor Statistics by metalworking plants, mostly small ones. In a 30-day period, one-third of settlements called for general wage increase, one-half for improved or new insurance plans. Many firms did not change old pension plans or set up new ones.

- **New titanium alloy for jet engines has been developed by Navy research.** Containing 5% chromium and 3% aluminum, new metal will be used to forge jet turbine blades. Other proposed uses: compressor turbine blades, tailpipe shrouds, engine firewalls, parts of engine itself. Machineability and corrosion resistance are same as stainless steel forgeability and better than most steels, safe operating temperature 800 F.

High frequency sounds can strip grease from metal in a matter of seconds, according to Dr. Robert Fehr, General Electric engineer. He envisions ultrasonics cleaning trim tanks along production lines, through which small parts would pass and be cleaned.

- **UAW-CIO's area-wide pension plan idea for Toledo employers is dead.** Union is accepting company plan from Plaskon Division of Libbey-Owens-Ford, thus ending its test strike for area-wide pensions begun January 31.

- **Assembly plants for aluminum prefabricated houses and school buildings** will be established in Australia by Bristol Aeroplane Co. (Housing) Ltd., London. Advance delivery of 10 schools to Government of Victoria, part of an order for 100 buildings, has eased school overcrowding in that part of Australia. Up to now, building components have been assembled in England.

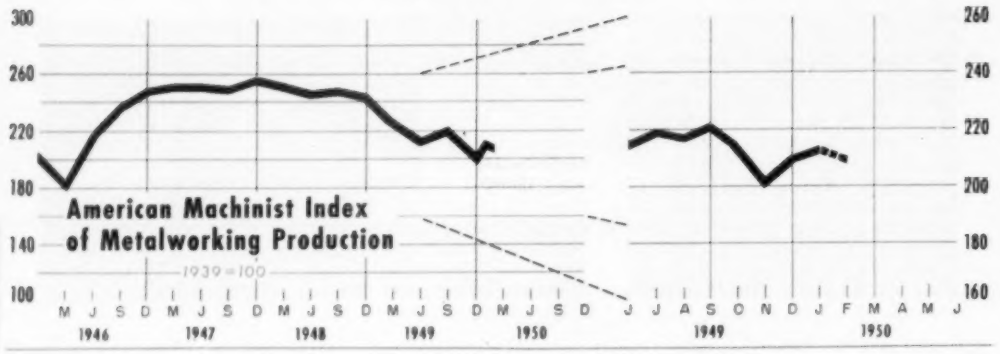
- **Small steam-driven electric generator has been invented** to keep buses warm when not in operation during cold weather. Heaters have been used heretofore, but run down the batteries. Now part of heater output makes steam to run the engine that keeps the battery charged.

- **CIO steel union will help fabricators get steel** to keep union members at work. Union's Washington office recently got steel mill to furnish bars to fabricator facing shutdown without them. Union would have solicited government aid, if necessary.

- **Purchase of a new Ford for personal use of every employee** with more than one year's service is policy of Mast Foos Co., Springfield, Ohio, farm equipment maker. Company retains ownership and buys license tags, Dallas E. Winslow, president, states.

NEWS

Gaging Metalworking



Metalworking To Zoom During Second Quarter; Steel Situation Tight

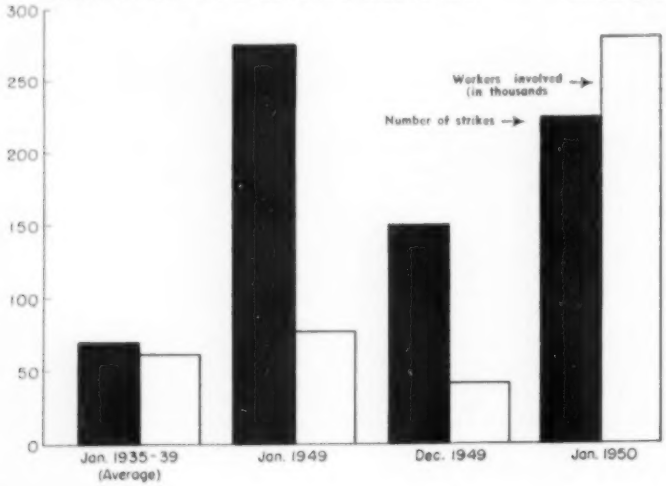
End of coal strike came just in time to save Metalworking from dipping severely as coal stocks melted. Any sag caused by strike has disappeared already. Spring months should see many metalworking lines zooming, especially in consumer products like appliances and automobiles.

What's worrying manufacturers, however, is second half of year. Second quarter looks safe for big operations; but third quarter appears less certain. Nevertheless setback from coal strike was enough to lengthen out the period of high activity beyond the anticipated time limit.

Scramble for steel is intense. Cold-rolled sheets are most critical, some users resorting to short-term conversions to insure needs. Stainless sheet and strip are in tight supply. Galvanized sheets too are on the scarce list, with certain customers turning to substitutions. There is heavy demand for spring wire going to automotive industry. Merchant steel products, mostly for farm market, are doing well seasonally. Some big consumers are reviewing specifications on large tonnage items with an eye on eliminating extras. Example: saving of $11,000 a year is expected by one company from changed specifications on alloy billets which remove one extra.

January's amazing spurt in new machine tool orders was not just a flash. February fell only slightly under January (which almost reached 100 on index of National Machine Tool Builders' Association).

What is important, sales did not come from any single industry, but were well distributed throughout



FEWER STRIKES, BUT MORE WORKERS INVOLVED

The chart shows a marked difference in strike activity during Jan. 1950 compared with Jan. 1949. There were fewer new stoppages this January than the year before, but many more workers were involved this year because of the coal and Chrysler Corp. strikes. These two accounted for 190,000 of the 280,000 workers involved.

Period	Work stoppages beginning in period: Number	Workers involved (thousands)
Jan. 1950*	225	280
Dec. 1949*	150	40
Jan. 1949*	275	77
Jan. 1935-39 (average)	70	62

*Preliminary estimates
Data: U.S. Dept. of Labor

INDEX

	FEB '50	JAN '50 (p)	DEC '49	JAN '49
	209*	**213**	**210**	**240**
Machinery	**201**	**194**	**245**	
Electrical Mfg.	**243**	**238**	**261**	
Autos, Trucks	**188**	**185**	**203**	
Transportation equip.	**218**	**216**	**251**	
Other metalworking	**322**	**232**	**250**	

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on man-hours worked in the five components above.

*Estimated (p) Preliminary

American Machinist Index is presented on opposite page for first time in a revised, simplified form. It shows the trend since beginning of 1946, with recent months magnified to make crystal clear the changes from month to month.

most user industries. Large ratio consisted of machines for replacement rather than new tooling. Thus intensive drive for replacement of old machines is beginning to pay off.

Automobile manufacturers retain top spot, however, as biggest customers for machine tools. All sorts of engine and automatic transmission programs are involved—new engines for Ford, new engine for Chrysler, new engine for Studebaker, new automatic transmission for Chevrolet, new transmission plant for Ford.

• • •

ECA continues to be financing agency for most machine tool orders coming from export sources. But competition from abroad is getting tougher both on prices and deliveries. German machine tool builders in western zones loom as potential threat in world markets. At same time, U.S. builders say that western Germany will be lucrative market for many types of their machines. Looking at long-term hazards, several American builders are surveying possibilities of establishing European factories with local sources supplying generous share of required capital.

• • •

Contract tool and die shops got more new business in January than in December, with resultant gain in backlogs. Shipments, however, were off slightly. Cleveland and Chicago companies are getting good volume of inquiries. Heaviest deliveries to customers have been in Ohio, Indiana and Illinois.

Some 25% more members of tool and die industry are doing job machining work than year ago, turning to that class from special tooling. More shops view the outlook more optimistically. Actual figures: 13 see it as excellent, 56 as good, 82 as fair, only 22 as poor. Too much tooling work is concentrated in few shops for good of the industry.

• • •

Prolonged strike at Chrysler has had little or no effect on automotive parts makers in Cleveland area. Slack which might have developed was taken up by diversion of production to parts for other automobile manufacturers or by expanded orders from parts replacement jobbers. Truth is that jobbers let inventories get too low, lately have come back in market. Result: average hours worked per week stood at 39.7 on March 1. Industrial employment in Cleveland district fooled the skeptics, increased a little in February, despite coal strike.

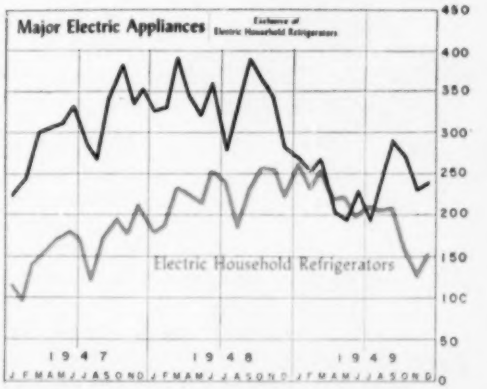
• • •

Exports got off to bad start this year, registering sharp drop from level in early 1949. Machinery and motor vehicles were among those taking beatings. Actual figures: total exports in January were $744 million, down almost $200 million from December and $360 million from previous January. Through 1949, exports averaged $1 billion a month.

Encouraging historical note—machinery exports last year touched $2.3 billion, up somewhat from 1948. Breakdown issued by Census Bureau shows: electrical machinery, $441 million; metalworking machinery, $196 million; other industrial machinery, $1.1 billion; agricultural machinery, $128 million; tractors and parts, $299 million. Automobile shipments abroad tobogganed to $728 million, down $160 million from previous year.

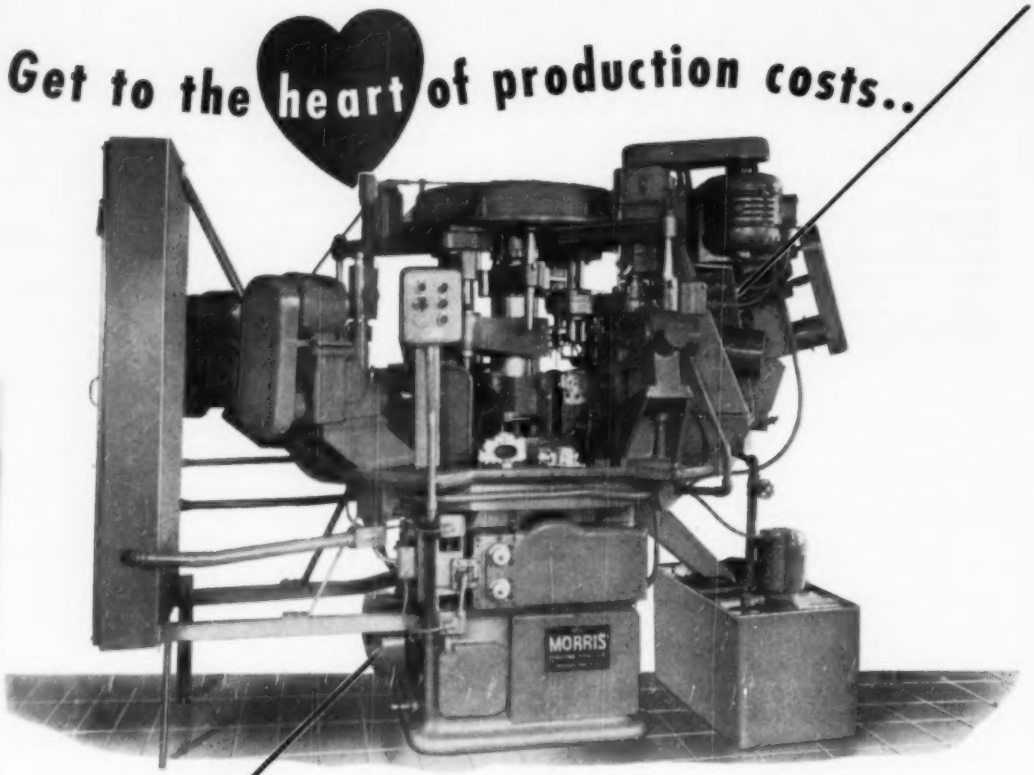
• • •

Sounds puzzling at first to say that both employment and unemployment are rising. Yet it's true. Number of people without jobs went up to 4.7 million in February, highest since August, 1941. Number of people with jobs went up to almost 57 million, just under year-ago level. Between January and February, some 210,000 persons joined the nation's growing labor force. Many were former students who graduated in middle of year. Very small percentage got jobs.

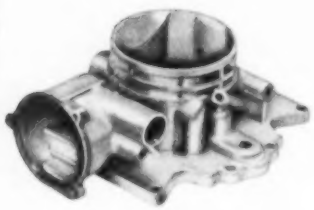


APPLIANCE SALES UP— *Monthly index of domestic unit sales billed, issued by National Electric Manufacturers Assn., shows household refrigerator sales up from November's 137 to 161 in December. Other major electric appliances are up from 228 in November to 238 in December*

Get to the heart of production costs..



with MORRIS MOR-SPEED Production Machines



• Each Morris Production Machine is designed to pay for itself and return dividends too, in higher production of precisely identical parts.

The 6-Station, Vertical Center Column Machine illustrated automatically indexes to drill, face and tap holes in either a right hand or left hand carburetor air horn. Fifteen operations are performed in a two cycle operation with a completed part machined on each index of the machine. Twenty-two spindles produce 300 pieces per hour at 80% efficiency.

The ability to perform machining operations on either right or left hand carburetor air horns is another example of Morris-designed versatility and cost cutting productivity.

THE MORRIS MACHINE TOOL COMPANY

"A better product at less cost— with MORRIS ENGINEERED PRODUCTION"

Builders of MOR-SPEED Line

933 HARRIET STREET CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Let's Have Faster Write-Offs

Congress is busily bent on eliminating or reducing excise taxes on furs, leather goods and other consumer commodities. That is fine.

But what is it doing, if anything, to reduce a tax load far more fundamental to the nation's economic health? We refer to the insistence of the Treasury Department that depreciation of new production equipment be parceled out over 15 to 20 years instead of being written off in a much shorter time.

There hasn't been a peep out of Washington lately on this subject. And the grapevine brings word that no action is expected in the near future. Why?

FEW IF ANY PEOPLE dispute the value of a speeded-up depreciation rate in stimulating investment in new plant and equipment.

Many machinery installations pay for themselves in a year or two. Many more are washed out so far as cost is concerned in five years. All but a few would be written off in not more than 10 years if the law permitted users to do so.

Other countries recognize this situation. They have adjusted their tax policies accordingly. They have enacted laws which reward rather than retard replacement of old machines with new.

In Britain, for instance, some 50 percent of the cost of a new machine can be depreciated in the first year.

Yet our own federal tax officials refuse to budge from their long-held archaic rules. They say that they will do nothing to change existing regulations unless Congress writes and adopts a new law liberalizing current policies.

Thus the Treasury Department unceremoniously dumps the problem in the lap of Congress and says, "It's your baby."

And Congress does nothing more than twiddle its thumbs.

THIS INACTION is a deep disappointment. Last year we were led to believe that constructive legislation on this subject would be forthcoming in 1950.

No less an authority than the distinguished chairman of the Senate Finance Committee, Senator Walter F. George, endorsed accelerated depreciation and said that "we've got to keep our production machinery new and up to maximum efficiency."

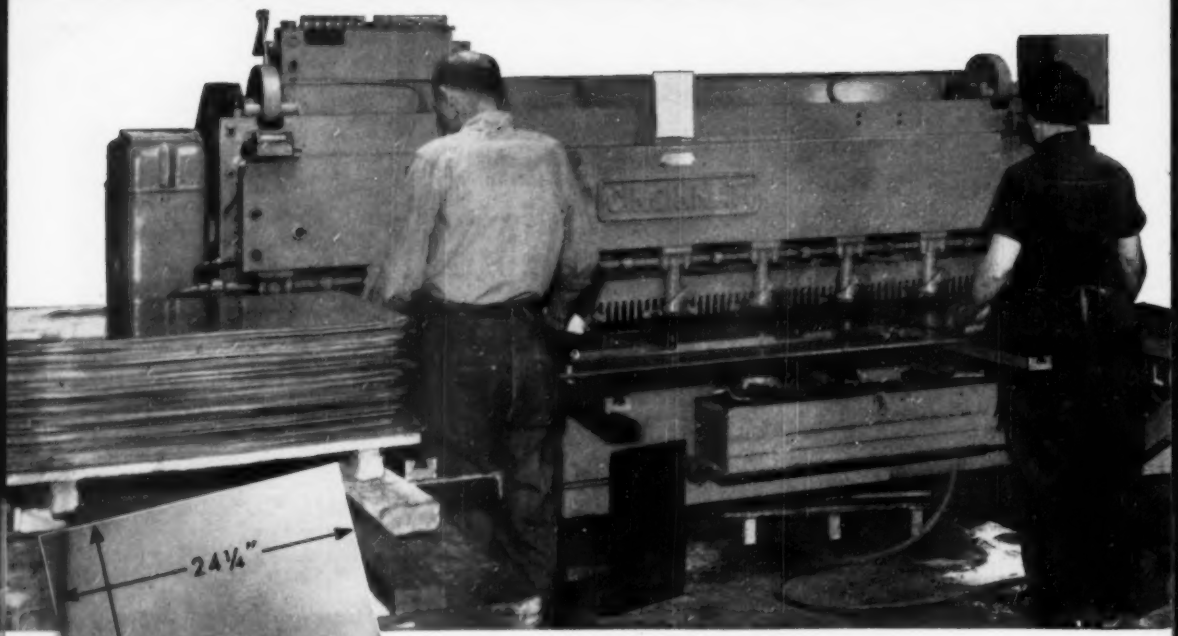
Other members of Congress, in both houses, have echoed Senator George's sentiments. Some of them introduced bills last year which would have eased the depreciation rules.

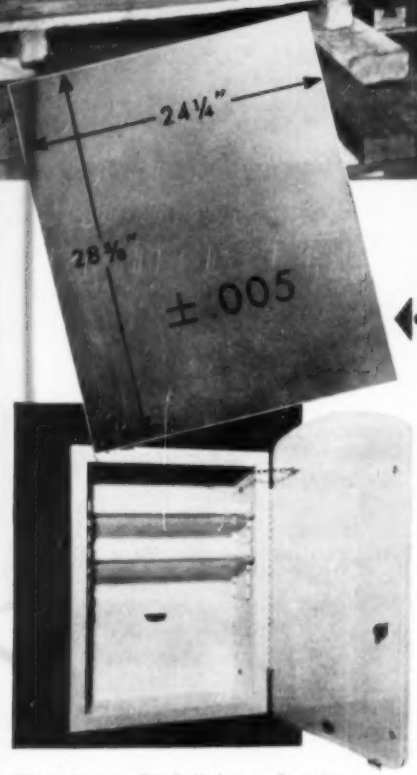
But still nothing happens. While excise taxes of which the consumer is conscious are likely to be cut, this more burdensome tax on the country's productive efficiency is allowed to stand.

WE APPEAL to members of Congress to consider the long-term beneficial effects upon the nation's economy of a new law authorizing quicker write-offs of new production machinery. As an end result, the government's revenues would be larger rather than smaller.

Speaking of a new depreciation law, Senator George said last year, "It is something that we will do as soon as we can." We ask, "Why delay longer? Why not do it now?"

Burnham Finney





Photos Courtesy The F. H. Lawson Company

ALL ALONG THE LINE

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SAVES MONEY!

At 400 an hour, accurate steel blanks, 24¼" x 28⅝", are produced in lots of 10,000 from 26 gauge stock sheets.

Costs are low because of the accurate performance, rapid gauging, ease of control and safety features of Cincinnati All-Steel Shears. One and one-half to two million cuts are made before knives need regrinding—an important factor in the low cost.

The shear is so accurate that all along the production line rejects are very low. Gauging for forming and bending operations is simple and rapid, assembly is smooth, time and money are saved, and a high quality of product is maintained.

Write for your Shear Catalog S-5. Consult our Engineering Department on your shearing problems.

These accurate blanks are held to tolerances of ± .005" on Cincinnati Shears in the shops of The F. H. Lawson Company, manufacturers of medicine cabinets, pails and all sorts of containers.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

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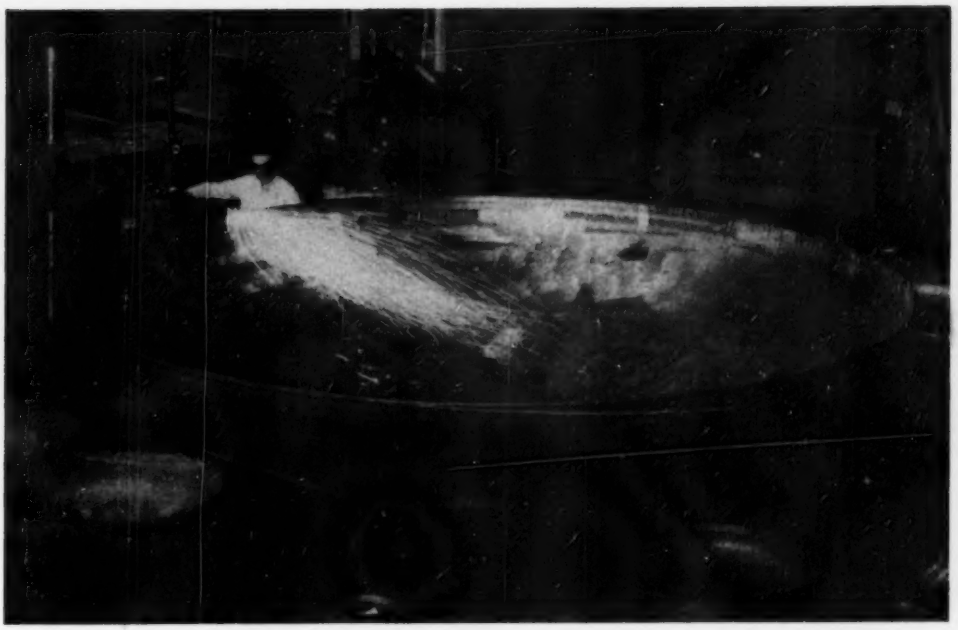


Multiple-torch head beveling machine has a rotary table for turning the work. Acetylene torches are carried on a radial-drill-type structure mounted on rails in the shop floor to facilitate operations on heads of widely varying sizes. On flat work, edge preparation by machining is preferred to flame cutting

EFFICIENT TANK FABRICATION REQUIRES SPECIAL EQUIPMENT

Power-operated weld positioners and rotators combine with specially designed welding and X-ray machines for economical production of massive processing equipment

BY A. I. NUSSBAUM, MOND NICKEL FELLOW, LONDON

PROCESSING equipment for the oil and chemical industries, and for other classes of work involving heat transfer and fractionating, is usually constructed from heavy steel plate and is extremely large and cumbersome. Specialists in this type of work, C. F. Braun & Co., Alhambra, Calif., have developed interesting techniques and a wide range of original fabricating machinery.

Most of the machines are of such a nature that they were not available on the market, and Braun was obliged to originate and build them in its own plant. Outstanding are special welders devised to carry standard submerged-arc welding heads for longitudinal and circumferential seams on long tank sections. They are designed to reduce to a minimum the amount of handling required, and are adjustable for various diameters of work. Used in conjunction with them are power-operated rotators mounted on tracks and drawing power from a third rail below floor level.

Within the limits of transportation facilities, complete processing units are fabricated within the plant, enabling better control of all operations to be exercised, and reducing the amount of field erec-

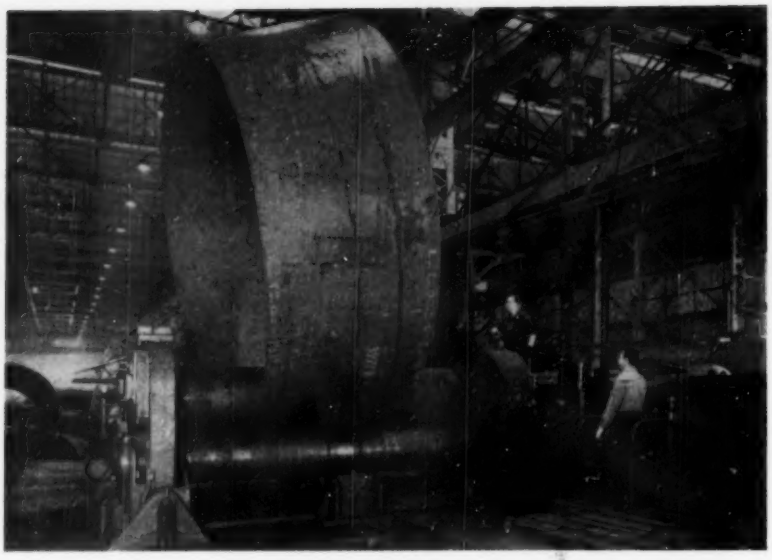


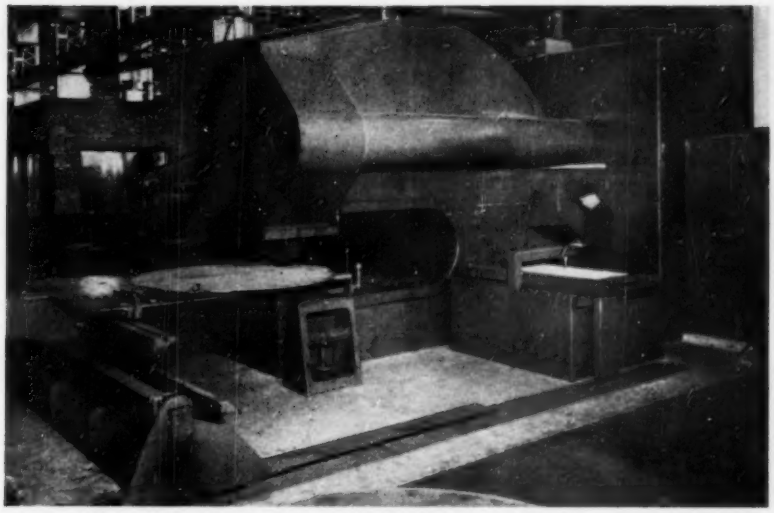
Plate roller handles material up to 3 in. thick, and has hydro-mechanical pulldown action. Roll gap is adjusted initially by mechanical means; once set, the actual working load of 800 tons is applied hydraulically. Rolls are 31 in. in dia, and the machine will take plates up to 10 ft. wide for straight or conical rolling

tion. This also permits stress-relieving of welded structures in one of the largest furnaces of its kind in the U.S., capable of taking vessels up to 135x14x14 ft.

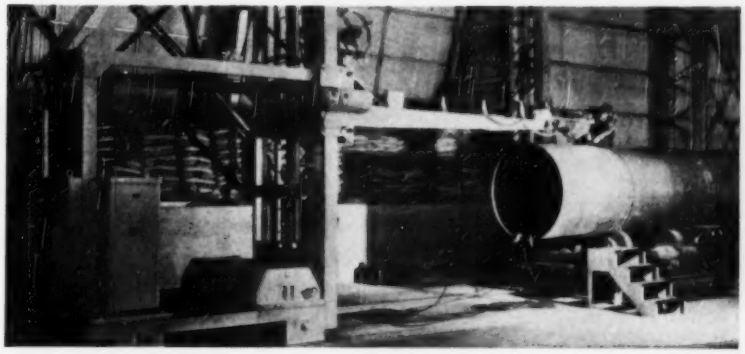
Although the company produces a standard line of heat exchangers, most items produced are designed and built specially for the job. Consequently, there are but few opportunities for the employment of high-production methods and machines. Where practicable, however, every advantage is taken of fully automatic equipment.

An original idea recently introduced into the plant is a portable assistant-foreman's office. A booth approximately 6x6 ft and 10 ft high, it is soundproof, air conditioned, and fitted with fluorescent lighting and telephone service. It contains a desk and shelves, and provides ample space for job files, drawings, schedules, inspection records and similar data. The booths are transported by overhead crane to wherever progress of a vessel calls for the temporary availability in its immediate neighborhood of such an information, record, and supervision unit to aid manufacturing efficiency.

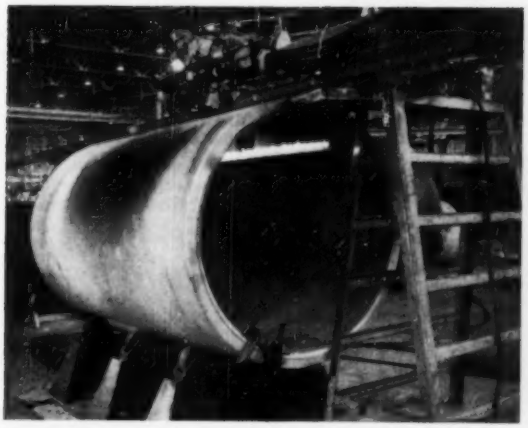
Hot spinning of heat exchanger distributors is performed on a specially designed mill. Welded cylinders are heated in an adjacent pit-type furnace and held in a rotating chuck while the forming rollers are fed down to produce the necked-down ends. Vertical and horizontal adjustment of the head permits handling various sizes



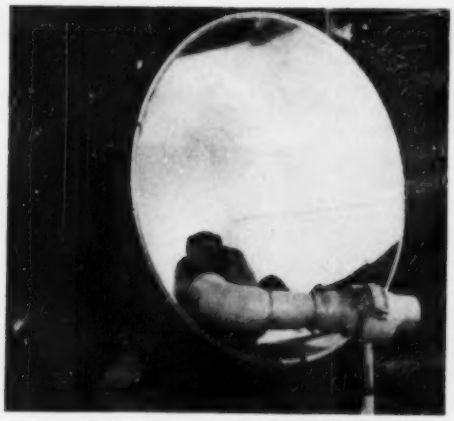
Automatic punch press for perforating trays can punch 5-in. holes in ¾-in. plate. Machine employs a photo-tube head which travels across a scaled-down master pattern of the holes and electronically guides the 300 - ton main punch head. Master templets are available for all standard tray hole configurations



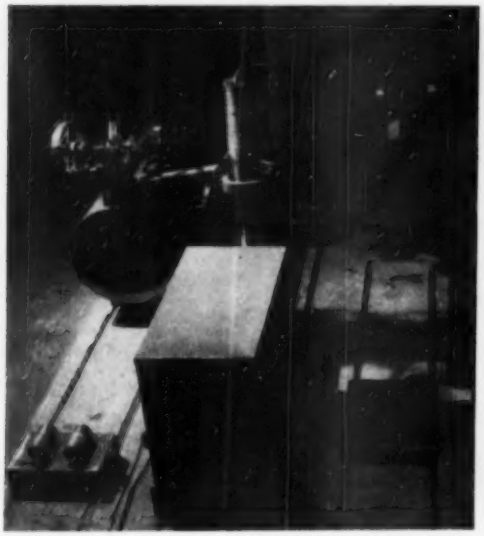
Track-mounted welder has horizontal boom that can be raised or lowered by gear-motor and can swing right or left, as desired. Unit travels on the same tracks as the 30-ton power-operated, variable-speed, adjustable-center rotator, and carries a submerged-arc welding head for longitudinal or circumferential welding



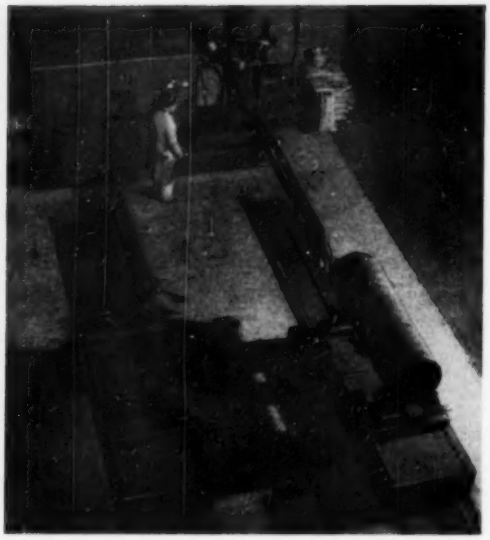
Longitudinal seam of a clad-steel shell is welded on a boom-type machine. Gas burner is installed inside the shell to heat under side of joint. Welding machine advances on tracks



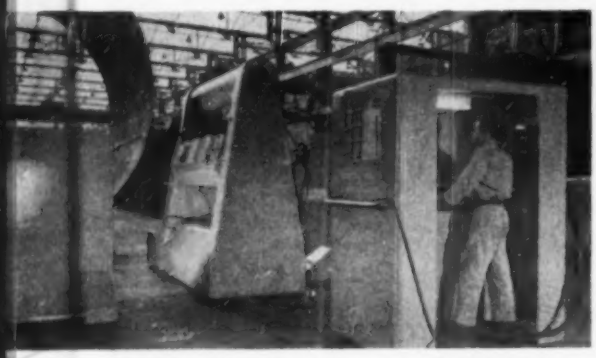
Worker health is protected by individual exhaust fans to remove fumes when manual welding must be performed in the interior of a vessel



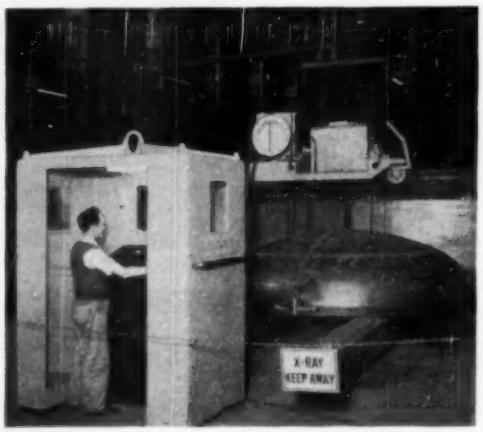
Car-type welders have radial arms carrying automatic welding heads, and move along center tracks. Work is set up on outer tracks and can be welded at one end of track while new setup is being made at opposite end



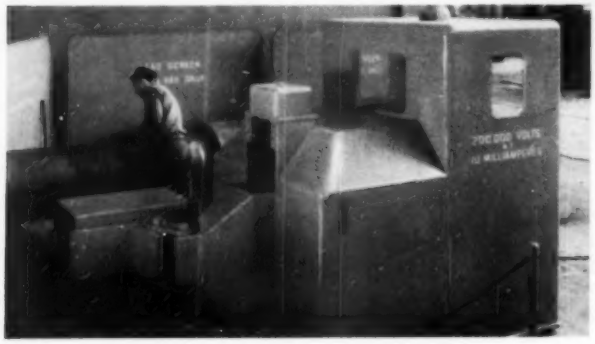
Idle welder time is saved by boom-type welder on tracks at right angles to two or more rotator car tracks. Boom carries an automatic submerged-arc welding head. Power pickup for cars is from third rail in floor



Shop inspection of welded seams with 400,000-v X-ray machine with separate tube head and control booth which can be transported to any location by overhead crane



Mobile X-ray unit has both crane pickup and wheeled base, and is particularly useful for field work. It is rated at 200,000 v at 10 ma. Magnaflux and Zyglo inspection procedures are also used for detection of subsurface and open surface defects respectively. Record sheets are kept of all inspections and filed for reference



Self-propelled X-ray unit has swiveling tube head which can also be raised and lowered to suit the height of the work. Special X-ray darkroom can handle 200 films a day. Developer is replenished after every 120 films and its temperature is maintained constant within 1° F to help avoid variations in density and permit uniform developing time

MECHANIZED FINISHING GIVES TRACTORS SHOW-ROOM GLOSS

Collaborative design and installation by The Oliver Corporation, DeVilbiss Company, and Despatch Oven Company has produced a tractor-finishing system with maximum working areas for assembly and finishing, with savings in floor-space requirements, all completed within one year

BY A. A. STIEHL

Maintenance Supt., Charles City Plant, THE OLIVER CORP.

THREE basic tractor models are assembled in a new Oliver Corp. building where painting has been coordinated with final assembly.

Because the plant is planned to turn out one model at a time, changeover requires complete rescheduling of all activities. Tractor-support fixtures can be adjusted to suit different wheel-base lengths. Painting jigs, fixtures, and other tools are a different color for each of three models — red, green, and yellow.

The 522-ft assembly conveyor is paralleled, near the delivery end, by a mechanized installation of finishing equipment that includes two monorail conveyors which are timed to deliver parts to the end of the assembly line as needed.

Capacity of the combined assembly and finishing installation is 15 of the largest-model tractors per hour. This is a 50% increase in production capacity over the previous assembly system. Maintenance costs are reduced at least 25%, and the finish quality is improved.

The system includes two continuously circulating paint-supply lines: one for green enamel and the second for red enamel. It also includes three direct gas-fired, convection-heated, and conveyorized Despatch ovens, four water-curtain paint-spray booths with enclosures, two air make-up systems for the spray booths, two wash units, and two conventional 4-in. monorail conveyors.

The slat-type main assembly conveyor moves at 3 to 4 fpm and carries assembled tractor chassis on 13½-ft centers through two staggered water-curtain spray booths, then through a 149-ft bake oven where the chassis are force dried at 170 F. This oven is the lower unit in the over-and-under layout.

The monorail conveyor for miscelleous sheet-metal parts is 1016-ft long and carries 12 parts per tractor. An adjustable-speed caterpillar drive runs the conveyor at 8 to 9 fpm and delivers about 185 parts per hour, on hangers, to the assembly line. These include the radiator-shell assembly, the hood, two wheel guards, two compartment covers, the rear-panel assembly, two radiator grilles, the radiator cap, and two hood doors for each tractor.

3-Stage Wash Unit

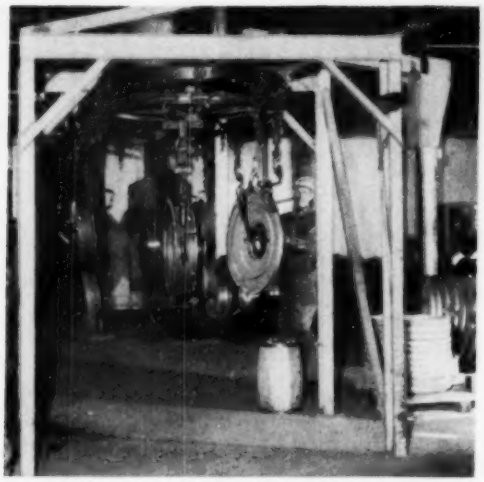
All parts on this conveyor pass through a three-stage wash unit, of right-angle design to conserve space. In the first stage, an alkali wash at 200 F is sprayed at about 15 psi over the sheet-metal parts to remove grease and dirt. In the second stage, the parts are sprayed with hot water at 200 F under 15 psi to rinse off any remaining alkali. The third stage is a chromic-acid spray at room temperature to etch the metal surfaces in preparation for the paint job. Drain areas are provided between the three spray stages to minimize carry-over into following spray baths.

Parts next pass through an elevated two-pass dry-off oven that is only 27 ft long. The design gives it an effective oven length of 50 ft so all surfaces are dried thoroughly in approximately 7 min.

Cleaned and dried sheet-metal parts are delivered to a water-curtain spray booth where all parts receive a coat of green or yellow enamel as they pass through on their way to the finish-bake oven. These parts are suspended from swivel hangers on 16-in. centers so the spray operator can turn them around. Parts are then elevated by the conveyor to the upper level of the over-and-under oven where they are force dried at 180 F. The sheet-metal-parts conveyor makes two passes through the bake oven before emerging to lower the parts to the floor where they are removed for almost immediate use on the final-assembly line.

Wheels, rims, and wheel weights are carried on a 702-ft conveyor which includes two caterpillar drives that are adjustable over a 2- to 6-fpm speed range. Normal operation is at 4 to 5 fpm. Four wheels and accompanying rims and weights are loaded onto this conveyor for each tractor to be assembled. These parts are carried through a two-stage wash where they receive heavy-alkali spray at 200 F to remove grease. This is followed by a clear-water rinse at 200 F. The distance between the wash unit and the spray booth is long enough to insure dry-off without an oven. After leaving the

A Slat conveyor moves partially assembled tractor through water-curtain spray booth for application of green enamel (at A on floor plan). Front chasis supports are adjustable for different wheelbases



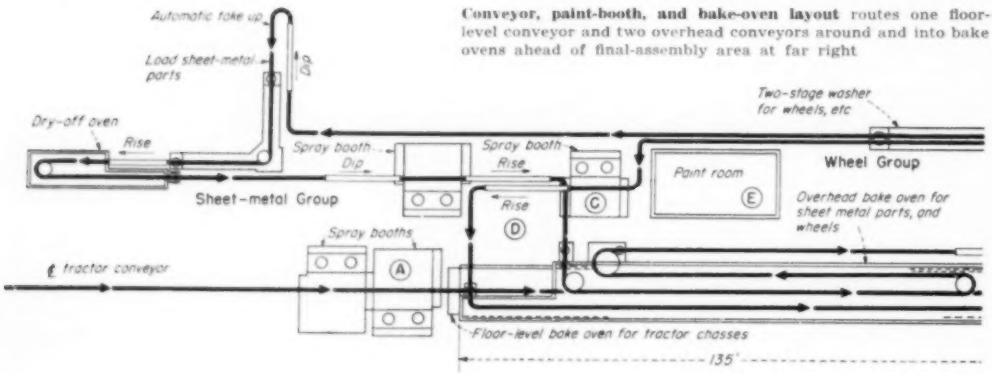
B Wheels, rims, and wheel weights are loaded on overhead conveyor at take-up loop (at B on floor plan) ahead of washer. Alternate hangers are designed to carry the three parts on rotation

spray booth, the wheel conveyor raises the parts through the same overhead bake oven used for miscellaneous sheet-metal parts. The wheels, rims, and weights are then delivered to the final-assembly line so right-hand wheels and weights are lifted from the conveyor at the proper side of the line, then the conveyor carries the rims to the other side of the department where they are removed for mounting tires. Finally, the same conveyor moves the left-hand wheels and weights to a second removal station beside the assembly conveyor.

Approximately 225 gallons of paint are consumed every 8-hr. shift in the four booths of the system.

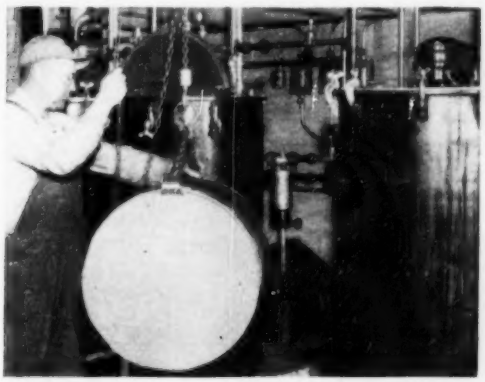
Green and yellow paint are supplied to the tractor booths and the wheel booths by four 120-gal. mixing tanks—two for each color. Two tanks supply throughout an 8-hr shift, while paint in the other two tanks is being mixed for the next shift. Viking vane pumps of 5-gpm capacity maintain a pressure of 20 psi in the lines. Each tank has a continuously operating agitator in the lid. Thinner is metered from an outdoor supply tank when making up a day's supply of paint. The 1-in. pipe lines for the paint system have wide sweeping turns to facilitate free paint flow to the guns.

All of the ovens have automatic temperature controls, with individual units for each heating system. Convection heaters firing low-pressure propane and heavy-duty recirculating fans deliver heated air into the oven chambers through ducts located along outer side walls. Internal heat and recirculating ducts with multiple-louvered adjustable ports allow uniform temperatures throughout the oven chambers. Waste gases and explosive fumes are exhausted by axial-flow fans located in plenum-chamber roofs at entrances and exits of the ovens.

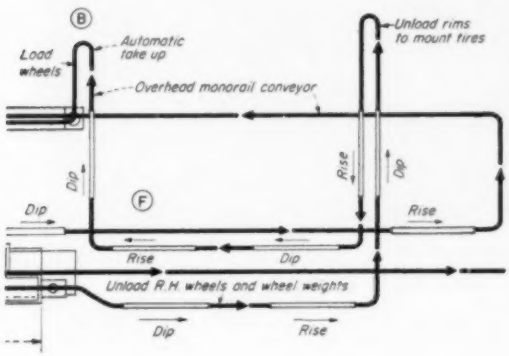


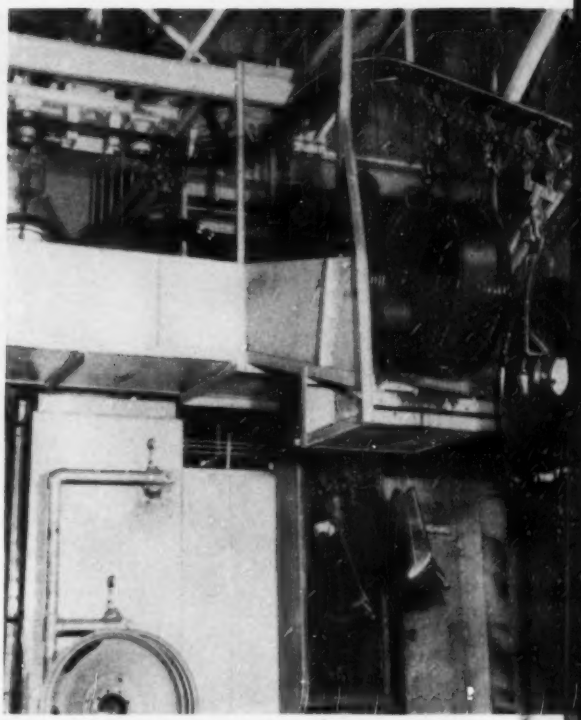
Conveyor, paint-booth, and bake-oven layout routes one floor-level conveyor and two overhead conveyors around and into bake ovens ahead of final-assembly area at far right

C **Wheel parts** are spray-painted in water-curtain booth after washing and rinsing (at C on floor plan). Red enamel comes from 20-psi circulating system

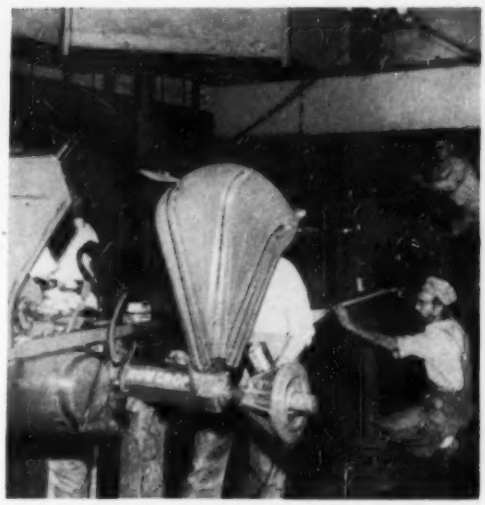


E **Paint-mixing tanks** in supply room (at E on floor plan) supply circulating systems for all spray booths. Paint is received in 53-gal drums, while thinner is metered into mixing tanks from outside storage supply





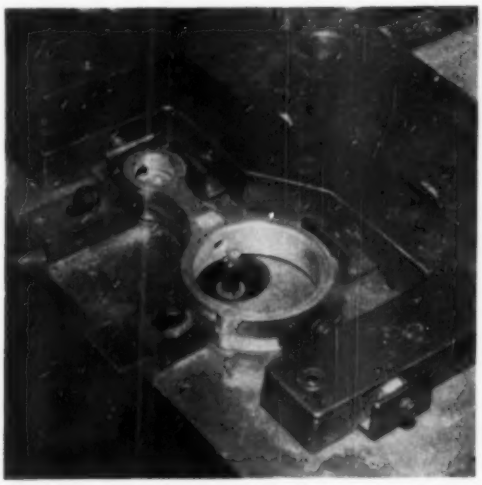
D **Two monorails** carrying wheel parts and sheet-metal parts pass as they rise to enter overhead bake ovens (at D on floor plan). Small parts are green



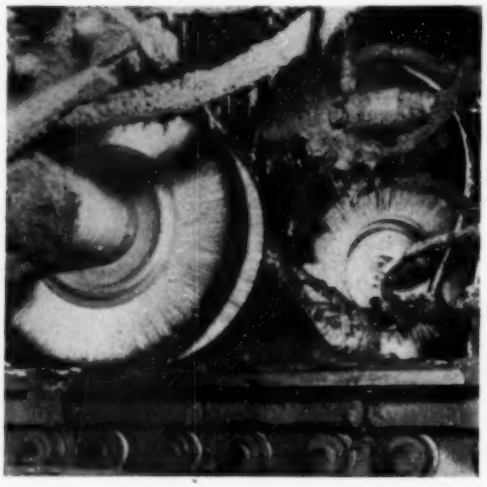
F **Dried tractor chassis,** wheel parts, and sheet-metal parts are finally assembled in area where all conveyors run parallel (at F on floor plan). Some decorative yellow paint is added at final assembly

SHOP SHOTS

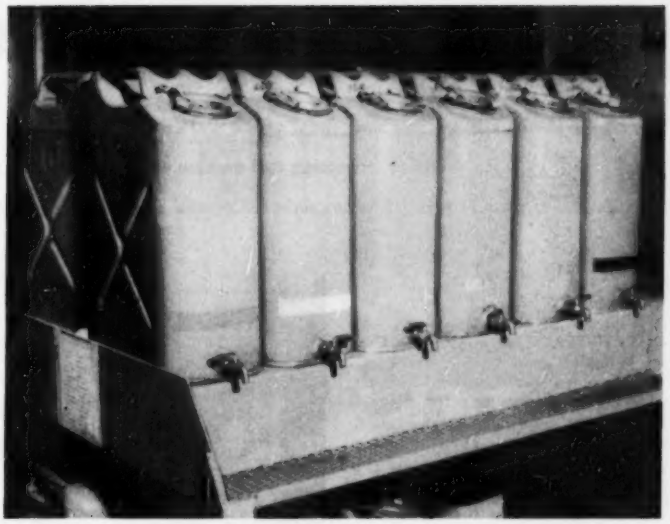
Hydraulic cylinders that operate C-54 nose landing gears and flaps are torn down and reassembled with a fixture that reduces overhaul time by 50%. Leather-padded throw-over clamp grips neck of cylinder and pin-and-bracket assembly holds end fitting. Bracket is adjustable along permanent baseplate for odd cylinder lengths. *Texas Engrg. & Mfg. Co.*



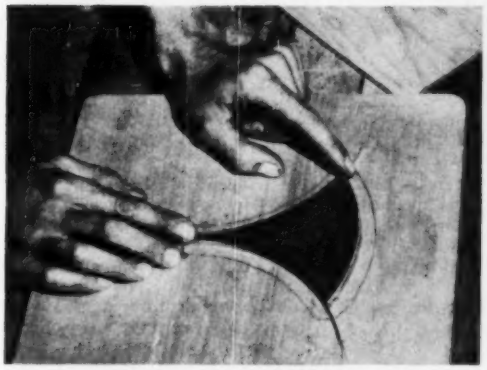
Oil holes in connecting rods for compressors are chamfered by two high-speed air grinders with round burs attached to the bed of an internal grinder. Fresh from the grinder, a part is placed between spring-loaded stops and pushed back and forth while motors turn burs. Each end of the oil hole contacts a bur. *York Corp.*



Automobile-window division bars are color-buffed on 14-head inline machine. First four stations are Tampico brushes used with abrasives; next three are buffers which operate dry. Automatic holders turn dividers over, then run them through the same stages to buff and polish the other sides. *Osborn Mfg. Co.*



Surplus Jerri-cans with small bib cocks brazed into their lower ends furnish lubricating oil in small quantities. Color-code stripes identify each oil and refer to coded lubrication points on nearby machines. Cans are refilled, as necessary, from central oil storage. Stands may be built to hold any number of cans on one or two decks. *York Corp.*



Aircraft-wing fixture clamps any wing contour to hold it vertical for minor repair work. Channeled base is 18 in. long; fits over 4-in. sawhorse or beam. Holes drilled at ½-in. intervals catch vertical straight member which bends curved plate to grip wing. *Suggested by Richard L. Woolley, Hill Air Force Base, Ogden, Utah.*

"Dinking" dies cut small irregular aircraft parts from duralumin or stainless steel up to 0.04 in. thick when dies are laid on platen, covered with stock, then smacked with flat block on press ram. Laid-out patterns are jigsawed through ¾-in. plywood, then hardened and bent steel rules are inserted in the cuts to extend out about 3/16 in. Finally 3/16-in. neoprene-cork shape is cut to fit inside rule to eject the part with its springy action after press stroke. *Boeing Aircraft*

Second Operations on Diecastings Cost

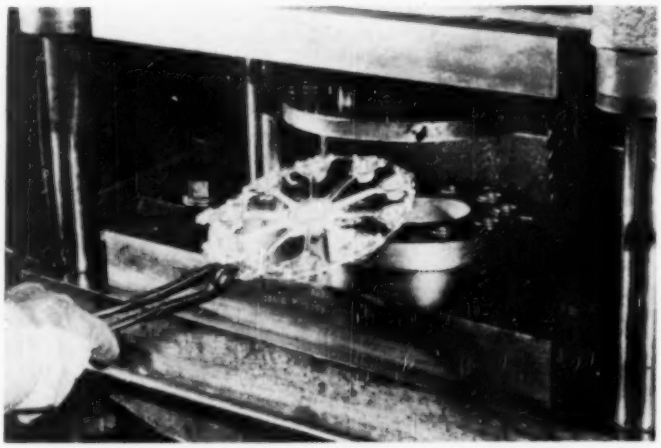
In theory, diecasting does most of the work on a part:

in practice, trimming and machining generally cost more than diecasting.

So, here is a chance to profit from experience of one of the largest manufacturers of diecast products

BY RUPERT LE GRAND
ASSOCIATE EDITOR

From an interview with diecasting tool engineers of the AC Spark Plug Division, General Motors Corporation



Strong flash around coupling nuts holds them securely in the cast while being ejected from the diecasting die and transferred to the trimming die shown

PRODUCTION processes for diecast products should be studied as a whole. This means: (1) In designing diecasting dies, review how the part will be trimmed and machined, (2) Devise second-operation tooling that will minimize operations and handling. By following this procedure, you can get higher production rates and probably the diecasting-machine operator can handle second operations while he is waiting upon the casting cycle. And you are less likely to run into troublesome "bugs" in processing.

Here are two examples from AC's practice that illustrate the tooling technique:

Case No. 1—Coupling nuts can be made of barstock, sheet metal or diecastings. The material used depends upon quantities and processing methods. AC currently diecasts this part 10 at a time. The tree is designed with strong sprues and has a heavy flash surrounding the OD of each nut. Flash at the bottom of the hole in the product is thin at junction with part body, thicker at the center by radiusing the core.

Reasons for these kinks in design of diecasting dies are: first, handling at the diecasting machine, and second, convenient trimming. To explain further: Coupling nuts are cast with an internal thread. The sturdy flash surrounding the parts prevents them from breaking out. Pressure is applied by ejection pins when the die has opened and the cores are being backed out of the coupling nuts by a gear train in the head. The cores rotate but do not move longitudinally.

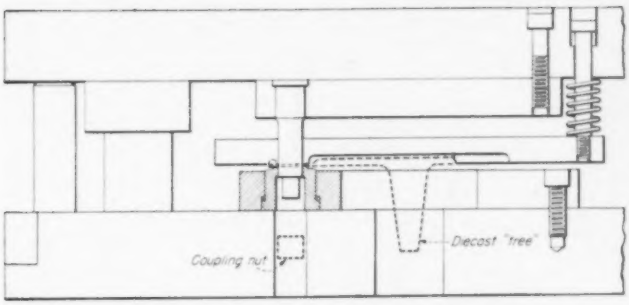
The operator takes the tree, trips the diecasting machine control for a new cycle, and turns around to a hydraulic press. This machine is fitted with a push-through die fitted with 10 shouldered punches. When the ram descends, the punches enter the coupling nuts and push out the flash at the bottom of the hole. Continued descent of the ram brings a shoulder on the punches into contact with the heavy flash surrounding the coupling nuts. Thus, the coupling nuts are sheared out of the tree and fall through the die openings onto a screen that separates them from the slugs. The operator now salvages the trimmed tree for remelting and returns to the diecasting machine to get the next cast for trimming.

Case No. 2—Should trimming be done before or after machining? AC makes a part for an automotive manufacturer, five to a gate. It's unusual to machine while the pieces are still in the gate, but here was the chance to get five at once, not one. Here is how it is done:

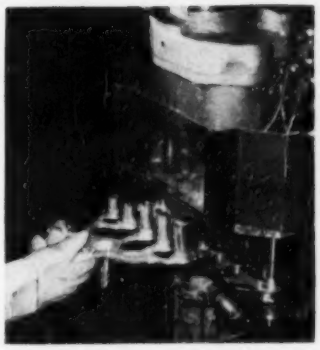
The part is a knob-like piece with a sleeve extending from the rear. This sleeve is produced by a bushing concentric with the core. Sleeve lengths on the parts vary. Each sleeve must be faced to its proper length and burred, and a cross-hole in the knob must be tapped.

A way-type machine is used. The operator places the gate in a fixture nest, which is moved upward by power so that the sleeves enter a bushing plate and are clamped. The rear head advances to tap the holes in each part, then withdraws. Now, a vertical head descends to

More Than You Think!



A shouldered punch pushes out the flash slug inside the coupling nut, then descends to shear the nut from the surrounding flash



Five parts are obtained at once, instead of one, by machining while still in the cast. Machining-cycle time is only a few seconds; operator also handles the trimming press

face the sleeves to length and remove any burrs in the bottom hole of the part.

Next, the operator turns to a trimming press, where the machined parts are cut from the gate.

In two secondary operations, the necessary work on all five pieces is performed, except finishing. And if the parts were not all machined at once, the cost per piece would be much higher. The trick here was to make the gate amply strong for handling the five parts simultaneously while machining and trimming.

Standardized Cores Save Money

AC has another idea that promotes efficiency in diecasting: Fuel-pump flanges have either a tapped hole or a clearance hole for a screw. At one time, dies were built in this fashion: (1) Make rough layout of tools. (2) Indicate sizes of inserts. (3) Leave final design of details to the diemaker. If a core broke, the die was removed from service, torn down, a replacement core made to the broken sample, and tool reassembled.

Current practice involves complete detailing of the die by the die designer. In reaching this status, the need for standardization of cores was foreseen, in order to reduce varieties in use from hundreds down to a few items. Four core designs are now standard for new dies. For older dies that will not take standard cores, core blanks have been made up. These core blanks are cores with common major dimensions and are finished, as required, to the tool drawing requirements. Usually, the diemaker need only face off these hardened core blanks with a carbide tool to get proper shoulder length.

Standard cores are purchased in large quantities, thereby effecting lower die costs. They are obtained in the hardened and ground condition, and thus give long service plus interchangeability.

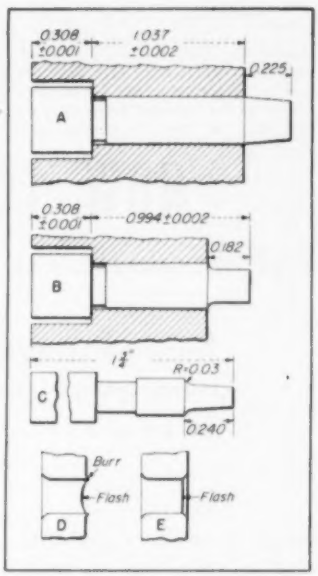
Standardized cored designs were made for:

Holes for tapping 6-32, 8-32 and 10-32 threads.

Clearance holes for 6-32, 8-32, and 10-32 screws.

Cores may have a round end for blind holes or a square end for through holes.

For through holes, cores are not made to throw flash at the *bottom* of the hole. It has been found that flash so located is likely to be dished and not easily pushed out, and besides a burr is thrown up at the edge of the hole. Hence, the die face is machined, or buttons are set into it, so that the rear of the hole is chamfered and the flash is a thin, flat membrane at the bottom of the chamfer.



Standardized cores and core bodies avoid lengthy die tieups to replace parts made by rule of thumb:

A—Core for screw-clearance hole when metal is 0.250 in. thick

B—Core for hole to be tapped in metal 0.1875 in. thick

C—Core body to be finished to die thickness

D—If bottom of hole is not chamfered, a burr may be thrown up to interfere with product assembly

E—By setting a conical button in the die face, the bottom of the hole is chamfered to avoid a burr, and the flash is readily pushed out by a tap

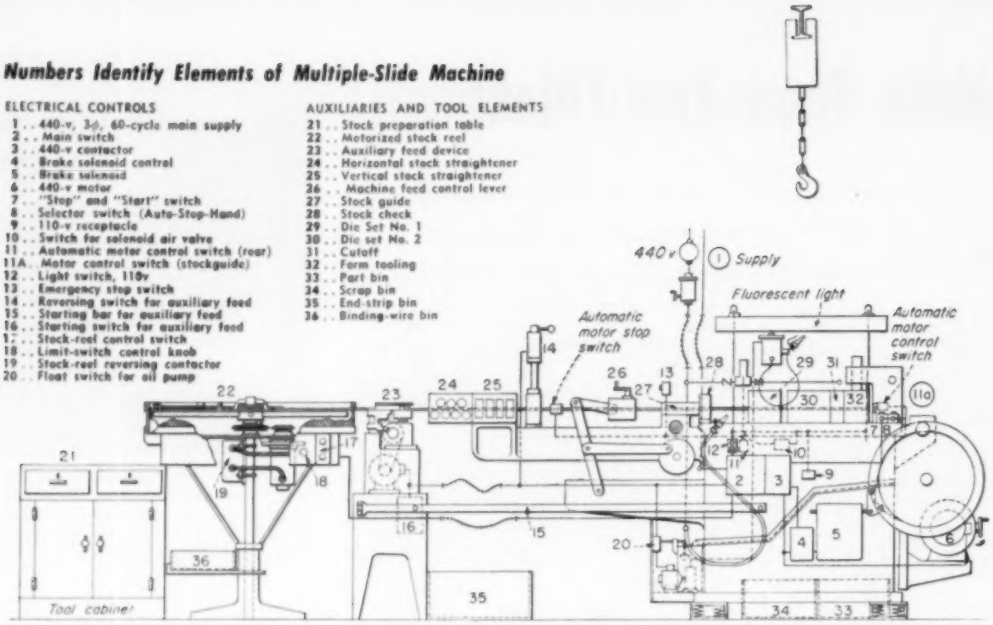
Numbers Identify Elements of Multiple-Slide Machine

ELECTRICAL CONTROLS

1 . . 440-v, 3ϕ, 60-cycle main supply
2 . . Main switch
3 . . 440-v contactor
4 . . Brake solenoid control
5 . . Brake solenoid
6 . . 440-v motor
7 . . "Stop" and "Start" switch
8 . . Selector switch (Auto-Stop-Hand)
9 . . 110-v receptacle
10 . . Switch for solenoid air valve
11 . . Automatic motor control switch (rear)
11A . . Motor control switch (stockguide)
12 . . Light switch, 110v
13 . . Emergency stop switch
14 . . Reversing switch for auxiliary feed
15 . . Starting bar for auxiliary feed
16 . . Starting switch for auxiliary feed
17 . . Stock-reel control switch
18 . . Limit-switch control knob
19 . . Stock-reel reversing contactor
20 . . Float switch for oil pump

AUXILIARIES AND TOOL ELEMENTS

21 . . Stock preparation table
22 . . Motorized stock reel
23 . . Auxiliary feed device
24 . . Horizontal stock straightener
25 . . Vertical stock straightener
26 . . Machine feed control lever
27 . . Stock guide
28 . . Stock check
29 . . Die Set No. 1
30 . . Die set No. 2
31 . . Cutoff
32 . . Form tooling
33 . . Part bin
34 . . Scrap bin
35 . . End-strip bin
36 . . Binding-wire bin



Automatic controls on multiple-slide press insure longer periods of uninterrupted production by guarding against costly, time-consuming tool smashups. Automatic motor stop switch shuts off power when stock end approaches machine feed mechanism, thus reducing danger of misfeed. Automatic motor control switches at rear and right side of press stop machine if misfeed does occur. Weak-point control also stops machine if stock hits obstruction during feed. Details of all electrical connections are shown in accompanying wiring diagram.

HOW TO BOOST THE OUTPUT OF

PART III...CONTROLS AND OPERATING PROCEDURE

You can avoid costly tool smashups, get lower cost per piece, and reduce operator fatigue by following these suggestions for correct machine installation and proper operating sequence

BY OTTO C. HELD

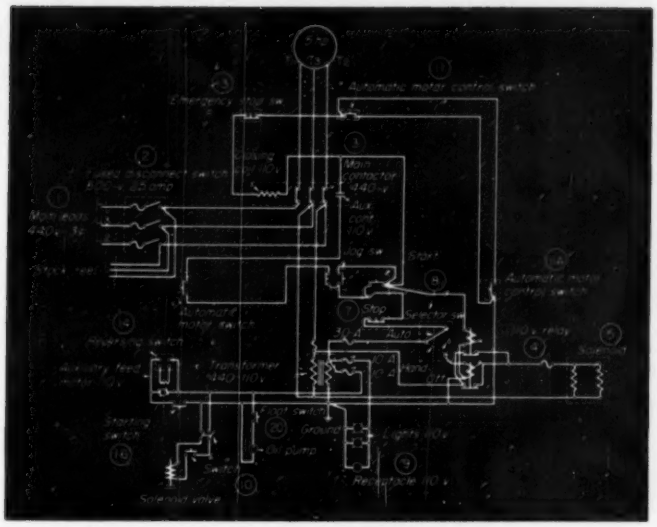
PRODUCTION ENGINEER, QUEENS, N. Y.

A MAJOR step toward greater output from multiple-slide presses is to raise the percentage of productive time on each machine. No matter how good the tooling or how complete the auxiliary equipment, top production will not be obtained unless the machine runs the greatest proportion of the day. To eliminate down time and needless delays, several things can be done: Automatic controls can be installed to guard against tool smashups. Tool resetting time can be reduced. Operating methods can be planned to reduce waste motion and effort. Worker effort can be stimulated with incentive payment plans. All of these things contribute to greater production, better labor relations, and lower unit costs and in many cases have proved well worth the time required to install them.

Electrical Safeguards

Motors for multiple-slide presses and for the automatic stock reel may be connected to either a 440- or 220-v electrical supply. Unless plant conditions make 220 compulsory, 440-v, ac, 3-phase, 60-cycle current is recommended for motors and brake solenoids. Lighting should be connected to 110-v service, and it is good practice to do the same for the brake solenoid control, oil recirculating pump, air valve solenoid, and motor for the auxiliary feed mechanism. A 400-watt, 440-110-v, single-phase transformer can be mounted on the machine for the 110-v source.

If the brake solenoid control is connected to the 440-v service in series with the solenoid coils, the



Electrical hookup for multiple-slide machine puts automatic motor control switches (11, 11A) and automatic motor stop switch in circuit with emergency stop switch (13) and "stop-start" switch (7). Solenoid (5) is connected to 440-v main supply, but switches are wired on 110-v service

MULTIPLE-SLIDE PRESSES

heavy inrush of energizing current runs through the control station and tends to weaken it. Servicing and replacement are necessary occasionally with a resultant increase in machine down time.

As the "on and off" pushbutton station at the right side of the machine is beyond reach of the operator when he is at the stock preparation table, an emergency "stop" station should be located near the stock reel. In this way, the machine can be stopped immediately from any operating position should a disturbance occur.

At the end of each work cycle the machine should stop automatically. If the stock end moves past the feed knife, the feed mechanism no longer can gage the length of stroke, and the stock is left hanging between positions. This often results in serious tool breakage and consequent machine down time. To avoid this difficulty, a Microswitch can be installed with a spring-loaded lever that rides on the face of the stock. As the stock end passes the switch, the lever snaps forward, cutting off the power. On the illustration, this unit is named the automatic motor stop switch.

A second Microswitch cutoff (11A) should be located at the extreme right of the track near the final forming position. This switch shuts down the machine in the event of a misfeed. It is operated by the front tip of the stock, and is linked in parallel with a third Microswitch (11) which is located at the rear of the machine below the camshaft. A cam leaves switch (11) closed for the greater part of the revolution but opens it just for an instant at the end of each stroke. The stock, as it is fed forward, pushes against switch (11A) and thus maintains the circuit during the instant of interruption. However, should there be a misfeed so the tip of the stock fails to reach switch (11A), then the latter cannot bridge the interruption, the power is shut off, and the machine is stopped by the solenoid brake within a fraction of a stroke.

Weak-Point Control

When the multiple-slide machine is in operation, the stock is pulled from the reel to the machine feed but is pushed from this point on through the machine. During each feed movement the stock passes through a number of elements that sometimes tend to block its course. Over most of the distance between these elements the stock travels through a special track or stock guide, and in most instances disturbances correct themselves before the punches and pilots connect. However, if a disturbance is severe, a misfeed occurs despite the stock guide. Therefore, at a predetermined point in the guide a device should be installed to permit the stock to move sideways if it hits an obstruction as it feeds through the tool elements. On both sides of this point, limit switches should be installed to shut off the power as soon as the stock moves sideways far enough to contact the switch. Called the "weak-point" device, this unit shuts off the machine and thus avoids tool breakage when a misfeed occurs.

When installing multiple-slide presses, care should be taken to run both electric conduits and compressed air lines where they will not interfere with operator movements. The best location is at the rear of the machine just to the left of the left-hand cam shaft. Pipes should be connected to the press with flexible metallic tubing about 12 in. long. This will absorb machine vibration. Machines also should be mounted on shock absorbers to cut down transmission of vibration to the floor and to other machines. Despite their low appearance, multiple-slide machines create hard impacts in rapid succession, and the resultant vibration should not be overlooked.

As compressed air entrains water particles, a water trap must be installed in the air line within easy

reach of the operator. This should be drained once a day. Ahead of the trap a gage should be installed so the operator can check available air pressure at any time. Pressure never should be less than 80 psi. Wherever air flow is controlled by solenoid valves, bypasses should be installed. Then, in case of valve failure, the machine can be operated with a continuous flow of air until the valve is repaired.

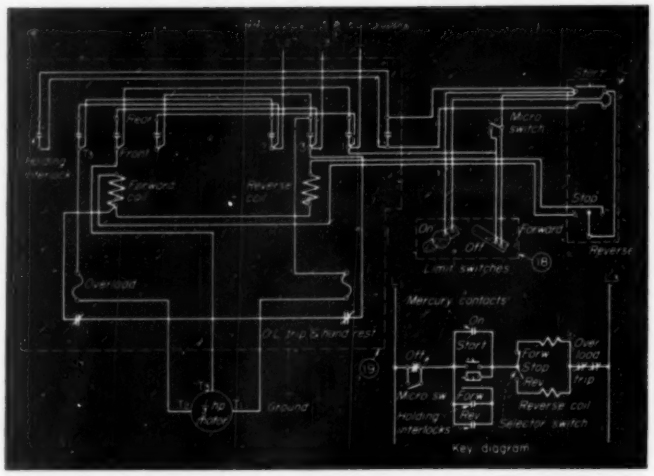
With solenoid brakes, the iron plunger should enter the full length of the coil. If not, the coil will draw from one to ten times the normal current, when energized, depending upon how far the plunger moves through the coil. If this rule is not strictly observed, fuses will blow frequently and other electric equipment may be damaged.

Machine Setup

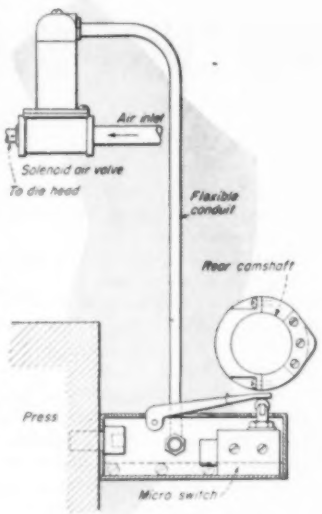
To avoid production losses, material should be very carefully specified. In addition to composition and hardness, the purchasing department should be given definite ordering information stating whether rolled wire stock or machine slitted stock is needed, which way it must be coiled, number of binding wires required, weight of coil, maximum edgewise bow allowed per unit length of stock, tolerances for width and thickness of strip, surface requirements, and the weight of stock needed to make 1000 finished piece parts, including 5% for end strips and shrinkage. If a motorized stock reel is employed, coils can be quite heavy—say, up to 45 lb — as the feed mechanism of the press does not have to turn the reel. Tolerances should strike a happy medium as prices and delivery dates become unfavorable beyond certain limits.

After new tool details are completed, they should be mounted and lined up accurately in proper sequence. As machine time is expensive, this should be done on a surface plate. An extra back plate should always be kept on hand for this purpose and it is advisable to arrange a line-up mechanism with which die sets can be opened and closed to simulate operating conditions. While mounting new tooling in the machine, the time-and-cam chart must be followed to get proper timing. The first setup should be made by the toolmaker in charge, assisted by the machine setup man, who also should be a qualified machinist. Sample parts should be checked thoroughly and adjustments made until parts are satisfactory. A shadowgraph or comparator permits quick and accurate checking. For these checks and all checks on setups, tolerances should be tightened considerably to make allowance for tolerance variations that occur in production.

When the toolmaker and setup man are satisfied with the quality of the new part, they should make two or three dozen samples for the project engineer. The latter should make a preliminary inspection report and forward samples and report to the head of the inspection department. Inspection then should conduct their own tests and if the parts are within drawing specifications should give permission to start production. This organization and division of responsibility under the over-all guidance of the project engineer is essential to the success of all multiple-slide projects and particularly of those in which unusually high press speeds are the goal.



Stock-reel controls operate motor connected to 440-v main supply. "On" and "Off" limit switches (18) stop and start reel motor to unwind only predetermined number of turns of stock. Switches are actuated through mechanical linkage from stock coil so operation is automatic. For manual control, Microswitch bridges circuit and push buttons (17) stop or start motor. Reversing can be accomplished through magnetic reversing contactor (19) simply by turning selector switch at station



Solenoid air valve is Microswitch operated. Valve is for 100-psi, 110-v, 60-cycle service

Operating Procedures

The operation of a multiple-slide machine should be motion-studied

to reduce operator fatigue and to make possible performance of most of the necessary manual labor during the press cycle. This planned motion sequence is recommended for all jobs but is particularly important where parts are long, the cycle is short, and the stock runs out quickly. In many cases a coil runs through the press in as little as three minutes. During this period there are many duties that should be performed by the operator. But each activity must be planned so it is done in the easiest and quickest manner and the whole then must be organized into a related sequence of movements that can be performed smoothly, easily, and, for the most part, automatically. Everything must be convenient and in its place so the operator can proceed without searching or hesitation. Only when this is done and the operator is thoroughly trained in the correct motions for the job can the best operator and machine performance be expected.

A rough breakdown of the operating sequence required to produce parts from slotted strip stock is:

1. Move control arm on stock reel (22) to rest stop. Remove round top plate.

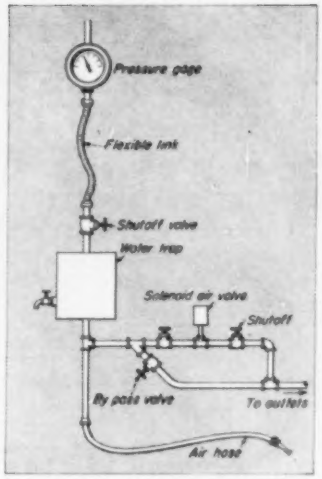
2. Take roll of stock from preparation table, observe location of slitting burr and place roll on stock reel (all burrs must face in the same direction); check position of directional control knob on stock reel.

3. Cut last binding wire from reel, throw wire into bin (36), and place cutting pliers on preparation table.

4. Locate control-arm "drag" between second and third outer turn of stock coil. Replace round top plate.

5. Grip front end of stock, pull over auxiliary feed (23) to mouth of vertical stock straightener (25), and drop stock into slot of auxiliary feed.

6. Push leg against starting bar (15) of auxiliary feed motor, and observe stock moved forward toward machine, and guide stock with fingers through straighteners, oil wiper, stop switch, machine feed mechanism, stock guide, stock check, weak-point device. Stop auxiliary feed when stock has moved about one-half inch into die set No. 1. Reset the knife on machine feed.



Air line should contain bypass so press can be operated on direct air if valve is in need of repair

7. Walk to multiple-slide control station, put selector switch (8) on position marked "auto," press motor starting button (7), pull starting lever, and observe stock moved forward through die set No. 1, die set No. 2, cutoff, and forming tools. First part should appear at end of fifth stroke. (If part fails to emerge, then press stop button quickly and investigate cause of delay.) Watch operation for next 10 or 12 strokes.

8. Reach for flexible oil hose and squirt oil liberally into tooling; replace oil hose.

9. Walk around head of machine to part bin (33) at rear and pick up three finished parts.

10. Step back to head of machine, where operator's testing fixture is located on top of guard above right-hand cam shaft. Test all three parts following predetermined procedure. At all times keep ears trained to sound of machine and be ready to act quickly should a change of sound indicate that something is wrong. Stop button (8) is within easy reach of left hand of operator while the latter is testing. Throw parts back into part bin if tests show that they are within gage tolerances.

11. Walk to front of machine and drench tooling with oil.

12. Walk to preparation table, lift coil of stock from storage and place on table. Pick up cutting pliers and cut three binding wires, leaving only one wire intact to prevent coil from unwinding. Discard wires in bin below. Straighten first 12 in. of stock. Bevel both corners of front end of stock with pliers. Replace pliers.

13. Walk to front of machine and drench tooling with oil.

14. Walk to rear of machine, lift hinged door in guard over slug chute and wipe slugs from hollow of back plate into chute. Emergency stop button (13) is then within easy reach of right hand of operator.

15. Walk to head of machine. Now stock should be almost consumed and machine will stop within the next few seconds. After machine has stopped, observe whether dies are sufficiently open, and, if not, turn selector switch (8) to position marked "Hand," take short piece of pipe from top of front guard, insert into holes in flywheel, and turn until dies are open. Replace pipe. Turn selector switch to position marked "Stop."

16. Pick up long-nose pliers, reach through opening in guard, grip front end of strip and pull strip out of machine. Replace pliers next to testing fixture.

17. Examine strip while walking to front of machine, if okay, fold once in the middle and discard into strip receiving bin below stock straighteners.

18. Take air hose from hook and blow out tooling and machine feed. Replace hose.

19. Turn lever on machine feed to retract feed knife. Walk to stock reel.

When the correct operating sequence has been established, a manufacturing layout should be issued under the drawing number of the piece part. It must contain the steps of the motion sequence, time and cam chart, raw material information, type of machine, tooling and hand tools required, test-

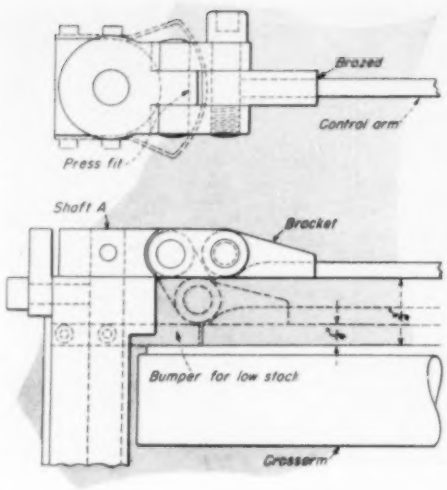
ing gages and fixtures needed, grade of operator for the job, and all additional information required to finish the part. This is necessary to duplicate conditions under which best performance is obtainable. Once jobs are broken up, there is a tendency for the setup to deteriorate the next time the job runs unless specific steps are taken to insure as good a setup as that originally developed.

Operator Incentives

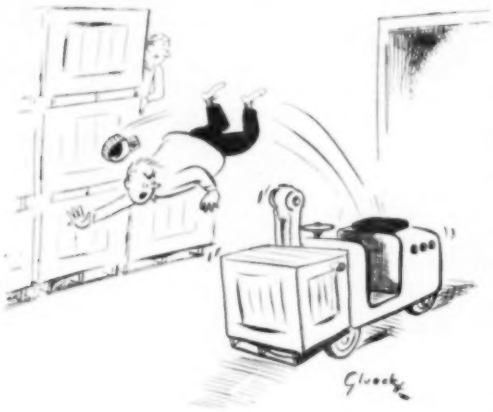
It is recommended that an incentive payment plan be installed to encourage operators to keep the machine producing as much of the time as possible. To give an accurate record of production, counters can be installed on the press. When this is done, it is a good idea to maintain a performance chart at the machine. At the end of each shift the supervisor enters the amount turned out during the shift. Should it be necessary to shut down the machine, the time of idleness correct to the nearest one-quarter hour should be entered as well as the cause of the shut-down. This, then, is the record of down time for tool or machine maintenance. Minor adjustments to tools or replacement by spare tool sets should be done by the setup man with the operator assisting him. The latter should receive straight pay for this activity, if possible. This acts as an inducement to get the machine in operation again as soon as possible to obtain the benefit of incentive earnings on production work. On major breakdowns, however, the operator should be shifted to other work, while the setup man and toolmaker make repairs or replacements.

Final testing should be done by an inspector with his own set of gages and fixtures on a near-by test stand. At least once during each cycle the inspector should visit the machine and obtain a small sample of parts for checking. Should he discover a discrepancy, he should notify the operating supervisor who must act to clear up the trouble. One inspector can service a group of presses.

Machines must be kept in good condition and operators should be held responsible for cleanliness of the machine, its auxiliaries, and immediate surrounding area. Machine servicing instructions should be listed and a copy fastened to the air pipe at the rear of the machine. Operators should wear gloves and safety glasses at all times and should have a full set of all hand tools needed for the job.



Motor-control arm is hinged so motorized stock reel can accommodate coil stock up to ⅜ in. This is an alternate design to that shown as part of motor control mechanism described in detail in Part 2 of this series



"Hey, who adjusted those brakes?"

Tips FOR TOP SHOP MEN

326 If you've just put in a new machine and it's not delivering as much as it should, don't assume automatically that the machine is at fault. Does the operator know how to get the best from it? Does he resent the change in method? Were some of his pals shifted to other jobs because the new machine took their jobs? One solution is to move the machine somewhere else for a while and to use a new operator.

327 If you have worked with your hands, your normal tendency in a crisis will be to work with your hands again. There are times when this will impress the men who work for you, do much to knock down any idea that you're an incompetent stuffed shirt. But never forget that you're paid now for working with your head, and that headwork demands more perspective than handwork is likely to give you. Also remember the thrill you got out of achievement and give the next generation the same chance to grow.

a manual of Gear Finishing Equipment

BY CHARLES G. PFEFFER, Gear Engineering Consultant

Production machinery in all phases of industry has shown steady improvement in the precision and quality of its component parts: Automobiles run longer and quieter; aircraft engines are lighter, more powerful and reliable. Principal key to these developments has been the quantity production of precision gears.

To meet a steadily growing demand, the machine-tool industry has created a new type of equipment—gear finishing machines. These include shaving machines for bringing the teeth to exact shape and spacing prior to hardening, gear grinders for use on hardened teeth, and lapping and burnishing machines for correcting minor errors and improving surface finish.

With this equipment it is possible to produce, at minimum cost, gears of a degree of accuracy hitherto undreamed of. But it must not be supposed that it is a cure-all, or that it will eliminate the necessity for proper care in preceding operations. Correct design and accurate cutting are still essential, but finishing adds those final touches necessary to bring the end product as close to perfection as is humanly possible.

Presented here is a comprehensive review of the latest finishing equipment now available, together with basic information on the use, capacity and method of operation of each different type.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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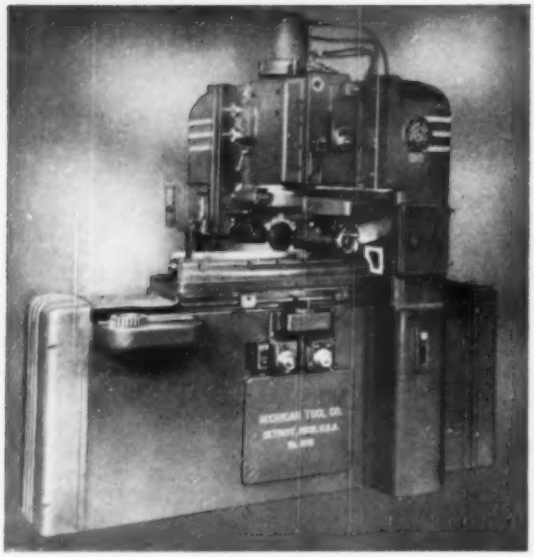


Michigan Tool Co.'s No. 900 rack-type gear shaving machine for spur and helical gears. Hydraulic operation with interlocking controls and completely automatic cycle permits a high production rate. Machine will handle work 1 to 8 in. in dia, 2-in. face width, and 3 DP max. Rack is mounted on the machine table, and each tooth, or blade, is an individual section produced to close tolerances to maintain uniform base pitch when assembled into a complete tool

Latest design of Michigan Tool Co.'s Model 870 rotary machine provides three selective methods of finishing any spur or helical gear, or involute spline. Methods are: Underpass shaving, transverse shaving, and Traverpass. Narrow-faced cutters are used for shaving any width gears witain the range of the machine, which is available in three sizes, viz; 1 to 8 in., 12 in., and 18 in. in dia, and 5 in. maximum face width

Gear Shaving Equipment

As a method of gear finishing on a production basis, as well as for commercial gears on smaller runs where uniform accuracy is required, gear shaving is widely used, and has become general practice in the automotive industry. It is applicable to all types of spur, helical and internal gears, and functions best and most economically when the blanks can be brought to the shaving machine in a free-cutting state with good machining properties. Frequently, gears are heat treated before shaving, but flame or induction hardening after shaving is also common. Standard procedure for most automotive gears, and for many other applications, is to carburize and harden after shaving.

To compensate for changes in tooth form and helical lead caused by hardening, modifications are frequently introduced at the shaving operation. These are usually developed experimentally, and depend largely on the type of tooth and the form of the gear blank. In keeping with modern practice, the blanks and tooling must be maintained with uniform tolerances to produce uniform and accurately shaved gears.

Pre-shaving practice varies considerably, and is governed primarily by the type of gear and the particular requirements. Protuberance hobs and shaper cutters are general practice, but with some newer cutting machines, off-pressure angle tools are used to provide a blend at the flank of the teeth. Conventional roughing cutters are also used when steps at the tooth flank are permissible.

As the name implies, shaving produces a fine, hair-like, curled chip. Therefore, the amount of material to be removed by the cutter should be held to the minimum that will allow the teeth to be cleaned up. Shaving cutters produce the most accurate and uniform gears when the cutting action is confined to the side faces of the cutter and the periphery is free of cutting action.

Gear shaving machines are of two basic types, one using a gear tooth rack as a cutting medium and the other, the rotary type, using a mating gear tooth form as a cutter. To produce the cutting edges, both the rack and the rotary cutter have serrations or grooves cut in the face of the teeth. The shearing action necessary to remove metal from the gear tooth surface results when the work and cutter are set at an angle. This is the crossed-axis principle which is the basis of all current gear shaving machines.

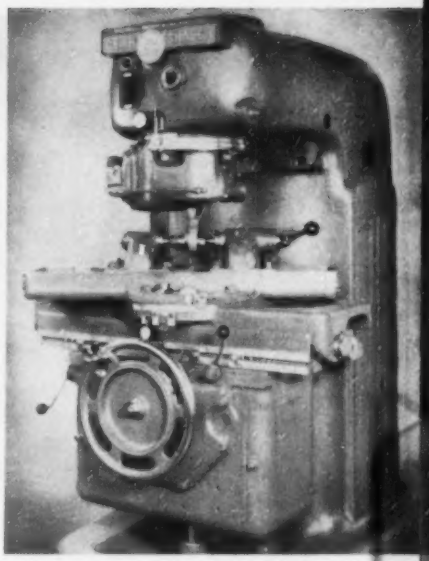
An example of the rack type is Michigan Tool Co.'s No. 900 shaving machine. In this model the rack is mounted on the machine

table which reciprocates at a uniform rate and therefore has a uniform cutting speed in both directions. Transverse reciprocation of the gear across the face of the rack assists the shaving action. This motion may be placed in any position within the face width of the rack. Duplex head and tailstocks, incorporated in the latest design, permit shaving two gears simultaneously. They may be identical, or of different sizes and face widths provided they are of the same pitch and pressure angle. One gear is mounted between centers, and the other on a stub arbor immediately ahead of the centers.

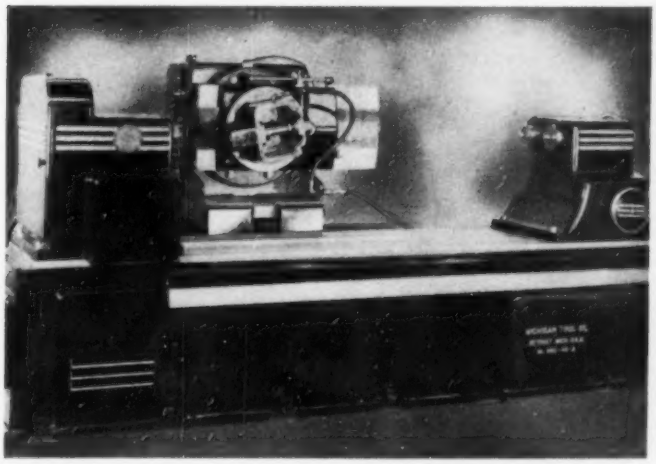
In the rotary shaving field, Michigan Tool Co. produces the Model 870 which offers three optional methods: Underpass shaving in which the work moves tangential to the cutter, transverse shaving in which the work, meshed with the cutter, reciprocates axially, and feed is radial, and Traverpass shaving, a combination of the other two. Underpass is especially useful for narrow-face gears, shoulder gears, short splines, and for producing a crowned gear tooth. Transverse shaving follows the conventional method and is applicable to wide face gears and long splines. Traverpass has the particular advantage of permitting shaving gears of a face width slightly greater than that of the cutter. It is not adaptable for shoulder gears or crowned teeth.

All these methods retain the crossed-axis principle. Underpass shaving uses a cutter somewhat wider than the gear width. The tangential feed moves the contact area across the face of the gear and cutter until the center line of the gear passes the center plane of the cutter. For crowned teeth the desired amount of crown must be incorporated in the cutter.

National Broach & Machine Co. produces a line of shavers under the trademark of Red Ring. The latest design of these is the Model GCV which is adaptable to several different types of shaving, including conventional, diagonal, elliptoid, and taper tooth. The improved shearing action of the cutter teeth in diagonal shaving makes it possible to finish shave a tooth in two cutting strokes, diagonally through the cutter and return to the starting point. Center distance of cutter and gear remains constant, so up-feed is not required. This fixed center distance and the rate of diagonal feed, determined by the change gear combination, produce a faster cutting cycle, and each gear is shaved identical as to size, finish and accuracy. Restrictions as to face width of cutter have been removed by this method, eliminating all need of wide-face cutters and special serrations.



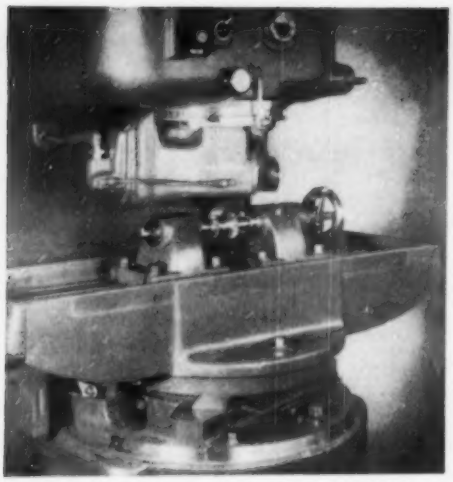
Red Ring gear shaver Model GCV produced by National Broach & Machine Co. for conventional shaving, diagonal shaving, elliptoid tooth form (crowned teeth) or taper tooth shaving. Conventional shaving cutters may be used without reference to the relationship of cutter face to gear face. Principle of rocking the table for elliptoid teeth is retained, permitting selection of amount and position of crown. For taper shaving, table is set at the desired angle



Large gears can be shaved on Michigan Gear Co. Model 856-48A, using the crossed-axis method for gears up to 24, 36 and 48 in. in dia, and a minimum diameter of 1, 2 and 4 in. respectively, on either spur or helical gears. Internal gears can also be shaved on these machines by use of a special cutter head. On the 24- and 36-in. sizes, the cutter is the driver and the work follows. On the 48-in. size the work is the driver and the cutter follows

For large flat gears up to 48 in. in dia and 8-in. face width, National Broach has developed the Model GCQ. In this type the cutter is reciprocated across the face of the gear, parallel to the axis, and is fed in automatically at each reversal of direction in its reciprocating motion. Power-driven table reverses in unison with the cutting stroke. Cycle is automatic and is controlled by suitable interlocking electric switches.

The largest of the Red Ring machines, the Model GCK will handle gears up to 120 in. in dia and on



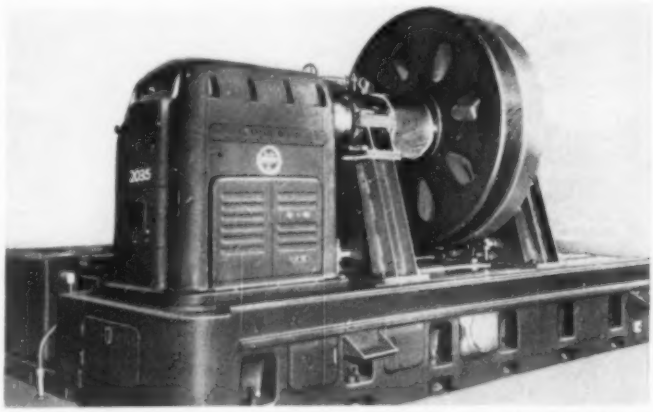
Diagonal gear shaver, National Broach & Machine Co. Model GCU, is similar to the model GCV, except that the design limits its function to diagonal shaving. For gears of 2-in. face width or less, this method of finishing offers advantages for economical production, such as short traverse, fixed centers, better shearing action, improved finish and longer cutting life. For crowned teeth it is necessary to incorporate the amount of crown in the cutter

Large flat internal and external gears can be shaved on the Model GCQ developed by National Broach & Machine Co. The rotary crossed-axis principle is employed, with the cutter driven by the work. Accessibility and provision for handling work and work-holding fixtures are features of this type machine. It is built in three sizes up to 48 in. in dia for spur and helical gears, internal and external, with a maximum face width of 8 in.

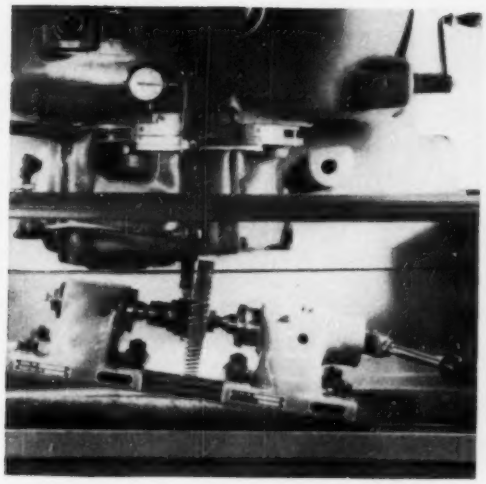
special models up to 220 in. Control of finishing operations on these large gears requires that checking facilities be incorporated as integral units of the machine. These include provision for journal alignment, and indicator dials for horizontal and vertical parallelism, helix angle, and pitch dia, all of which function with the gear in place in the machine. After setup is completed and all tooth elements found to be within the required limits, the shaving cycle becomes automatic, and all similar gears are finished alike.

The third major producer of gear shaving machines, the Fellows Gear Shaper Co. has available the No. 12 for spur and helical gears up to 12-in. PD, and similar machines for 18- and 24-in. gears. These operate on the crossed-axis principle, the cutter being supported by the head and slide which is reciprocated axially by a lead screw. Control of the cutter toward the work is by a feed cam which insures positive positioning for the finished gear diameter. Electrical controls govern all machine functions, with signal lights indicating the progress of the automatic cycle. Crowning requires a special attachment, and the work table is then provided with a central pivot. Drive to the table is through a torque motor and change gears which swivel the table about the pivot. Adjustable stops limit the movement of the table and control the amount of crown.

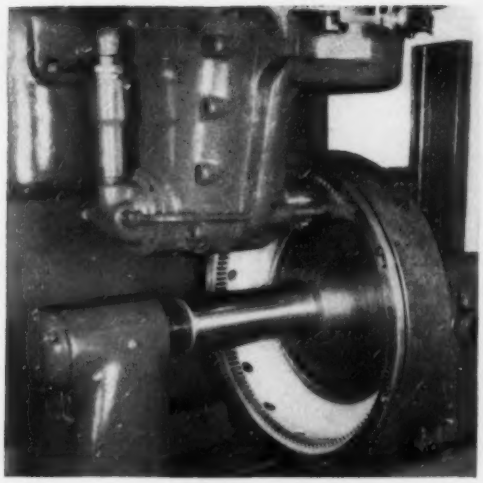
Fellows also builds the No. 4 fine-pitch shaver and the No. 11



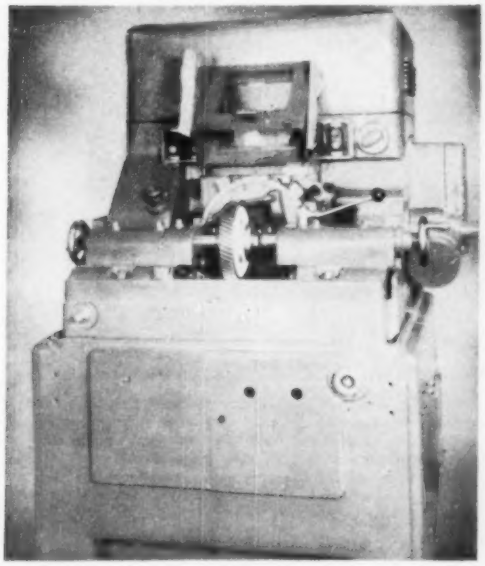
Spur and helical gears up to 120 in. in dia and 111-in. face width can be shaved on this Red Ring machine, Model GCK. Four standard sizes are available, plus a special model having a capacity of 220 in. in dia. Shaving action is based on the crossed-axis principle, with the gear driving the cutter. Controls are arranged to be reached easily from either side of the cross saddle. Hardened and ground ways are provided at the wearing surfaces, with adjustments to maintain alignment



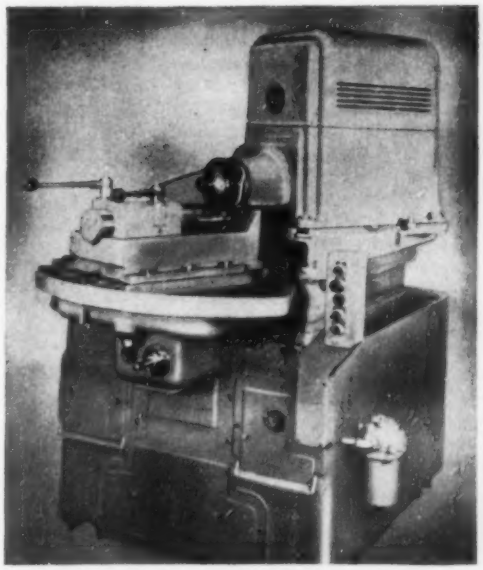
Conical shaving cutter represents the latest development in the cutter field by National Broach & Machine Co. It was developed for shaving gears close to a shoulder where diameters and clearances make conventional shaving impracticable. Tipping the work permits an increased crossed-axis angle for good cutting action. Applicable to a standard machine, the special sub-table and matching-angle cutter are the only special equipment required



Internal gears can be shaved on the standard Red Ring Model GCV by use of a special auxiliary head which replaces the regular cutter head. Shaving is performed by the conventional crossed-axis method, with the work driven by the cutter. As most gears of this type have open centers, special workholding fixtures must be provided, and the blanks must be so machined as to insure concentricity between the teeth and the locating points

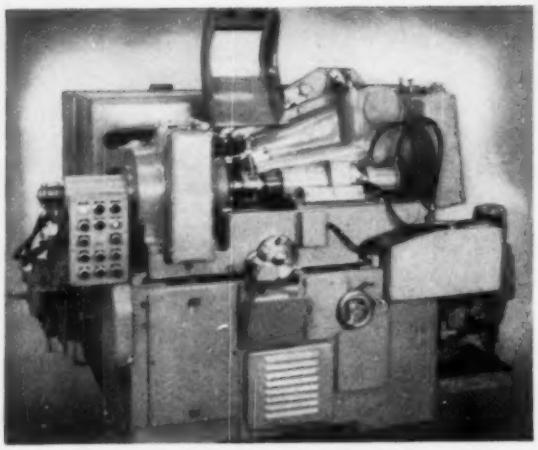


Rotary crossed-axis gear finishing machine No. 12 produced by Fellows Gear Shaper Co. will shave external spur and helical gears up to 12-in. PD and 5-in. face. Maximum helix angle is 45° and maximum DP is 6. Similar machines are available for 18- and 24-in.-dia gears. Worktable is adjustable for parallelism with the tool slide to compensate for work deflection or to produce a taper tooth. To produce crowned teeth the machine can be equipped with a crowning attachment



Full Tool No. 8 gear shaver by Fellows. Machine incorporates the angular setting of the work relative to the cutter reciprocation and the crossed-axis method, and can use either conventional or Full Tool shaving method. As depth feed is cam operated, provision for controlling the number of cutting cycles is necessary for each shaving method. Change gears are provided to govern the speed of the cam drive. Compound table and holding fixture are adjustable for proper bearing and parallelism

Designed specifically for shaving fine-pitch gears, the No. 4 machine produced by Fellows Gear Shaper Co. will handle spur and helical gears of 16 DP and finer, and up to 4-in. PD. The crossed-axis principle is employed, with a rotary shaving cutter driving the work. Gears up to 1-in. face width can be shaved on this compact, totally enclosed automatic-cycle machine

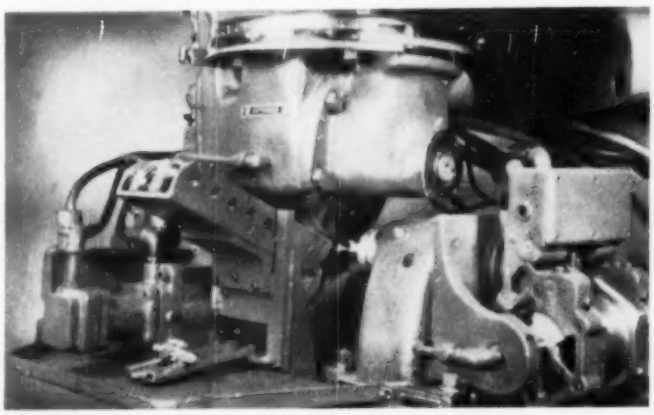


Major change in shaving practice is represented in the Fellows No. 12 machine. The cutter is of the disk type, similar to that used on a gear shaper. Both sides of the teeth are finished in one traverse, and both spur and helical gears can be handled. Capacity is 12-in. PD, 5 DP, and maximum face width 8¾ in. (6½ in. for gears over 9-in. dia). Crowned teeth can also be produced

internal shaver for spur and helical gears. On this latter machine, parallel-axis shaving is used, with the tool driving the work and reciprocated by a crank motion. Traverse motion is controlled by guides, straight for spur gears and of the same lead and hand as the gear for helical gears. The cutter is of the conventional type, and shearing action is produced by the relative tool rotation and reciprocation. One side of the teeth is finished as the tool is rotated in one direction, and the other side when rotation is reversed. The enveloping action of the internal gear and external cutter produces the best shaving action and smoothest finish when the cutting edges travel at an angle relative to the tooth axis. The angle is produced by the rotation and traverse of the cutter.

One of the latest developments in the art of gear finishing is the Fellows No. 12 machine which employs a disk-type cutter that can be sharpened on the cutting face. This is in contrast with the conventional type which is usually returned to the manufacturer for sharpening and regrooving.

The trend of development, as exemplified by the latest designs produced by the major manufacturers is toward the principle of feeding the cutter across the face of the gear at an angle. This permits shaving speeds to be increased 25 to 50%, reduces shaving time because of the shorter cutting strokes employed, and produces better finish with longer tool life and a greater range of gear face widths for each standard cutter. Introduction of automatic loading and unloading devices has also contributed much to increased production rates by making the latest shaving machines completely automatic in operation.



Automatic loading device increases production and reduces finishing costs. Gears roll into mesh with the cutter and are held by power-operated fixtures or arbors. Provision is made for gaging and metering the work to the cutter so only one gear can be engaged at a time, and so oversize or off-angle gears cannot enter the cutter. Cycle is fully automatic, and operator attention is required only for keeping the chute filled with gears to be shaved, and for unloading the discharge chute

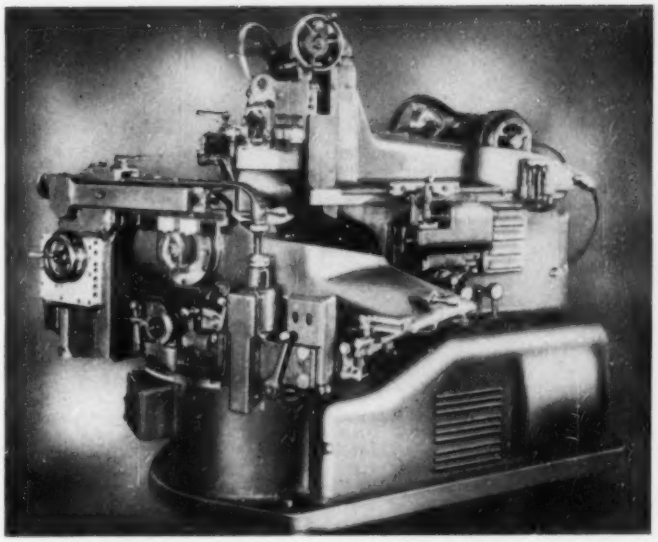
Gear Grinding Equipment

When close accuracy of tooth elements is required after hardening, the finishing operation is frequently performed by grinding. This is particularly the case with gears for diesel-electric and turbo-electric drives, marine reductions, and reverse gear units, in which the gears must transmit heavy loads and have good wearing qualities and least possible weight. Most aircraft gears, with their inherently light sections, are similarly ground after carburizing and hardening to rigid specifications for core and case. Heat treatment of such gears presents problems of distortion difficult to control consistently, and the resulting errors must be corrected by grinding after hardening. Master gears, where the ultimate in accuracy and wear life is necessary, and both internal and external splines of involute or square forms, where press and shrink fits must be held within close limits, are usually finish ground after the hardening operation.

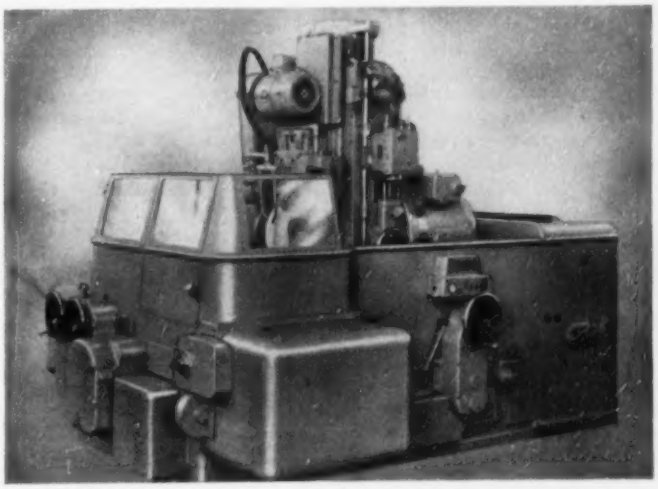
The field of ground gears extends in many directions, and the choice of finishing method is governed entirely by the form of the gear, the type of service, and the accuracy considered necessary.

Gear grinding takes two forms; the generating method, and the formed-wheel method. In the former type, exemplified by the Pratt & Whitney single-wheel grinder, the active form of the wheel corresponds to that of a straight-sided basic rack. The wheel enters the space between the teeth of the gear as it is rolled through the generating motion. One side of the two teeth adjacent to the space is ground on the approach roll and the other on the recess roll, so one tooth space is ground with each pass of the wheel.

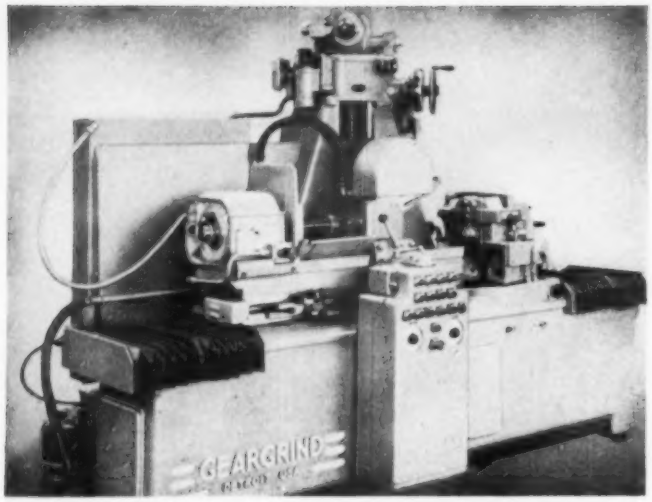
Three dressing diamonds are employed, operated from a single lever. Those for dressing the sides are independently adjustable by a vernier to angles from 13 to 30°, the one for dressing the OD is not adjustable. The table carrying the work spindle, tailstock and master



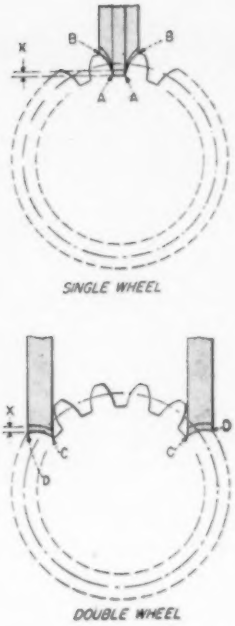
Pratt & Whitney generating type, 10-in. single-wheel gear grinder for spur and helical gears. Wheel and dresser are carried on a hydraulically operated ram equipped with speed control. Ram stroke is adjustable for length and position. Roll of the gear as it passes the wheel is controlled by a rack and a master gear mounted on the end of the work spindle. Each pass of the grinding wheel grinds one tooth space. Wheel is dressed by three diamonds



Vertical, universal, hydraulic, 26-in. machine, largest of the Pratt & Whitney line, employs the generating principle of a straight-sided rack rolled through the tooth space. Motion of the wheel and ram is vertical. Gear is mounted on a rotary table which also moves longitudinally so the wheel grinds faces of two adjacent teeth per cycle. Control of the generating relationship and carriage motion is through change gears for a wide range of pitches and tooth numbers



Gear Grinding Machine Co. Type G.G. 10x24A machine is the latest development in formed wheel grinding. It employs two wheels, straddle mounted, an important departure from the conventional single wheel. Work table is hydraulically actuated and reciprocates under the wheel. Indexing, hydraulically operated and interlocked, is from a 9-in. index plate in the head. Automatic wheel feed, adjustable as to number of strokes and rate of feed, is incorporated



Single-wheel grinding necessitates taking a heavy cut at B for even a small feed increment at A. This increases wheel breakdown and necessitates more frequent dressing with consequent lower wheel and diamond life. Lighter cuts at A may not be sufficient to keep wheel free cutting and may cause glazing and burning. With double wheels, amount of stock removal at C and D is nearly equal, surface speed is virtually constant, breakdown is more uniform and less dressing is required

gear is hydraulically operated and provides variable slow speed for grinding, and rapid for indexing. Indexing takes place at both ends of the table movement by means of indexing racks mounted in front of the master rack. At the end of roll motion, with an indexing rack in mesh with the master gear, a hydraulic valve moves the master rack out of engagement. The indexing rack then moves the master gear and work one tooth, the master rack is reengaged and the cycle continues automatically.

For spur gears the center line of the work is parallel to the ram movement and the work slide moves at right angles to the center line of the work. For helical gears the work slide is set to the helix angle of the work, but ram motion and direction remain unchanged. The helical gear is therefore generated by the same combination of straight line and rotary movements as the spur gear.

The master gear is a duplicate of the gear being ground as regards number of teeth and face diametral pitch, but need not have the same pressure angle. The master rack is of the same pitch and pressure angle as the master gear. The independence of pressure angle allows a small degree of flexibility, and permits grinding gears of slightly different pitch than that of the master gear.

The 10-in. machine will accept work or arbor up to 13¾ in. in length, and of a maximum diameter of 10 11/16 in. Minimum root dia with small master gear spindle is 13/16 in., and pitch range is between 3 and 16 DP, depending on size of gear. Wheel diameter is 12 in., maximum face width 6 in., and helix angle 45° RH or LH. The 18-in. machine is similar in construction and operation, and has a capacity of 18½-in. OD, and a range of 3 to 12 DP.

Pratt & Whitney 10-in. two-wheel grinder is similar in operation to the single-wheel model, except that the ram does not reciprocate. Wheels are 20 in. in dia and remain in the fixed position. Maximum face width is thus limited to approximately 1¼ in.

A somewhat different type is found in the Pratt & Whitney 26-in. vertical, universal, hydraulic machine for spur and helical gears. This model also employs the generating principle, but wheel travel is vertical, and the gear is mounted on a rotary table which also moves longitudinally. Motion of the wheel and ram out of grinding range is by rapid traverse, and indexing occurs during the return stroke before the wheel reaches grinding position. Wheel dresser is motor driven, and two side diamonds, guided by standard formers, dress a straight V form while a peripheral diamond forms a flat periphery. When modifications such as tip relief or full fillet radius are required, special formers are needed. For helical gears the wheel head may be swiveled around to the required angle.

Form grinding, the original method of grinding gear teeth, has made considerable progress in the past 40 years. Wheel dressing methods and controls have been

improved, and accuracy of indexing has received particular attention. Machine design has followed the modern trend of increased rigidity and ample wear surfaces for smoother action and increased accuracy over a longer period.

Latest development in this field is the Gear Grinding Machine Co.'s Type G. G. 10x24A which uses two straddle-mounted wheels. Feed is automatic, and is hydraulically operated. At the point of reversal of the reciprocating table, the wheel feeds down and grinding continues in one tooth space until desired size is reached. The work then travels to clear the wheel for indexing and resetting the wheel head. When a predetermined number of teeth have been ground the dresser moves into position for wheel truing. The entire cycle is fully automatic.

If a final finishing cut is necessary, the conventional method of grinding is used. That is, the operator dresses and feeds the wheel to depth manually.

The two-wheel principle and automatic wheel feed are also incorporated in the Type G.G.1 for internal spur gears. Operation of this machine is similar to that of the external machine, including the automatic cycle. Capacity is from 4 to 20-in. root dia, and 5-in. face width.

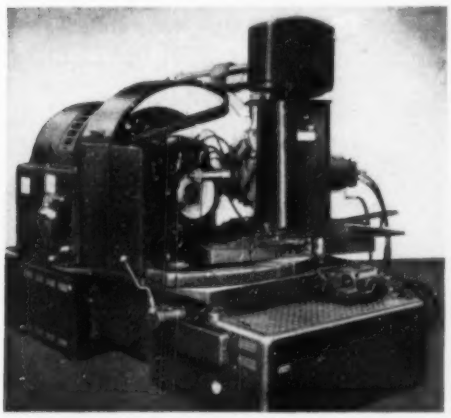
Grinding of spur and helical gears, however, imposes one restriction which must be considered when the form of the blank is determined: To finish grind the full tooth length, wheel clearance must be allowed. The amount of this clearance depends on the type of equipment to be used and the diameter of the wheel required.

Bevel Gear Grinders

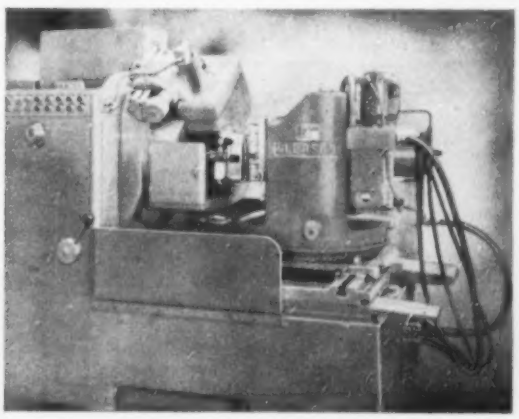
Development of the spiral bevel gear, in 1913, and the equipment for its production, demonstrated the many advantages of the curved-tooth bevel gear in operation and production. The demand for increased wear life and smoother operation, however, made it necessary to develop equipment on which such gears could be finished after hardening. The period of 1931 to 1938 saw the development of various types and sizes of grinding equipment to meet this demand and to make possible the grinding of spiral bevel, Zerol and hypoid gears. This equipment produces the highest possible degree of accuracy as regards tooth spacing, profile and concentricity.

Functions of the machines are similar to those used for cutting curved-tooth bevel gears. A cup grinding wheel is used, comparable to the face-mill cutter of the generating machine. Wheel dressing is by hydraulically operated diamond dressers adjustable for pressure angle, fillet radius, wheel diameter and speed. Automatic operation includes wheel dressing, infeed between grinding passes, and stopping the machine when the gear is completed. Sequence of grinding passes and wheel dressing is selective. Curved-tooth bevel gear grinding takes two forms; the generating method, and the non-generating method, the latter being termed Formate.

The Gleason No. 27 Hypoid grinder employs the generating system similar to that used on curved-tooth bevel gear genera-



Gleason Works No. 27 Hypoid grinder for spiral and Zerol bevel gears and hypoid gears. This machine will grind generated pairs of gears or generated pinions to mate with Formate gears. Capacity at 1 to 1 ratio at zero spiral angle is 15½ in. PD max., and 2-in. face. At 40° spiral angle maximum PD is 22½ in. and 3-in. face. At 3 to 1 ratio and the same spiral angles, maximum PD becomes 23 and 34 in. Coarsest pitch is 2 DP



Formate hypoid gear grinder No. 18, developed by Gleason Works for flat, curved-tooth bevel gears of approximately 3 to 1 ratio and higher. This machine employs a non-generating method and is designed to permit rapid production of accurate gears. At 90° shaft angle, extreme ratios are 15 to 1 and 2½ to 1. Maximum spiral angle is 45°. Largest PD is 24 in. and maximum face width with 12-in.-dia wheel is 2 in. at zero spiral angle, and 3 in at 40°

tors in which relative motion of work and wheel-carrying cradle automatically generates the correct tooth form. This motion corresponds to that of a gear rolling with a crown gear, of which the wheel represents one tooth. Rotation of work spindle is continuous and timed with the reciprocating motion of the wheel-carrying cradle. The continuous rotation of the work spindle necessarily causes a number of teeth to be skipped at each indexing, but control through change gears is so arranged that a sufficient number of cycles are completed to finish grind all teeth. Indexing takes place on a down roll when work is withdrawn from the wheel. Wheel is dressed at the beginning of the grinding cycle, and one or more times during the cycle, depending on the number of passes required and the amount of stock to be removed. Control of tooth bearing is obtained by dressing the wheel to a modified form and by altering the generating roll.

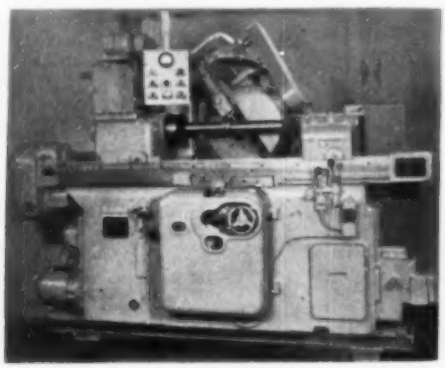
The Formate grinder, produced by Gleason, employs a non-generating method consisting of an oscillating wheel spindle which carries the wheel from end to end of the tooth. The full tooth length is covered and both sides are ground simultaneously. Indexing is from tooth to tooth through hardened and ground notched index plates. Automatic dressing system is so arranged that after the oscillating motion of the wheel stops, the wheel swings into dressing position, feeds out to allow for dressing across the wheel surface, and returns to starting position.

A rough dress occurs at the start of the grinding operation, and a second, finish dress, before the second from last grinding pass. At completion of each revolution of the blank, feed cams advance the work the proper amount for grinding until size is reached.

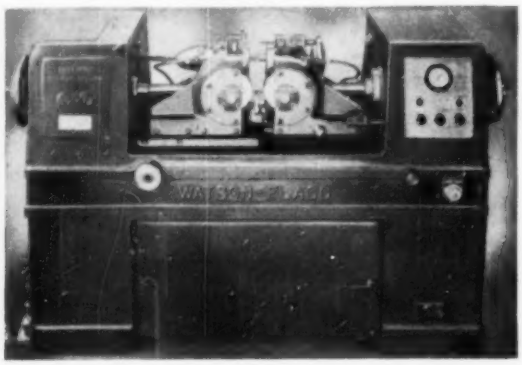
Worm Grinding Equipment

Improved production equipment is an important factor in worm gear design. Introduction of the thread grinder, and developments in grinding wheels and grinding oils have made it possible to grind worm threads in material after hardening. Accuracy of pitch diameter, pressure angle, lead and helix angle can be held to close tolerances, and a smooth, ground finish obtained. The earlier practice of using large ratios and single threads is giving way to lower ratios and multiple threads, and worm grinding is now a production procedure. Worm threads in softer material frequently are finish ground when accuracy of form, lead and size is a governing factor.

Both single- and multi-ribbed wheels are used, and dressing may be by diamond or by crushed wheel forming. When accuracy and finish are governing factors, the diamond-dressed, single-rib wheel is generally used. When production is the chief requirement, and tolerance specifications permit, the multi-ribbed wheel is used. In diamond dressing, wheel contour is controlled by formers of suitable pitch and pressure angle which guide the diamonds through a universal truing device. Three diamonds dress the wheel flanks and thread root. To produce rounded crests and roots a pantograph truing device is necessary. Lead is controlled from an accurate leadscrew, with change gears providing the necessary ratio of work



Latest model Jones & Lamson automatic worm grinding machine with indexing provisions for setting grinding wheel to helix angle up to 50° right or left. Machine will handle work up to 42 in. in length and will grind a worm 18 in. long at any location within 30 in. from the headstock center. Built-in vapor exhaust system removes the fog caused by the grinding oil contacting the high-speed wheel. Similar machines are available in different sizes



Watson Flagg Machine Co. Model C precision thread roller, using two 6-in. thread rolls, straddle mounted. Machine has hydraulic flow control for rapid approach, and hydraulic rolling pressure. Cycle is automatic, and micrometer size control is effected by a Micro switch. Capacity is from No. 6 (0.138 in.) to 4 in. dia. Maximum length of thread is 3¼ in. Controls are electrically operated from right side of machine

spindle rotation and lead. Helix angle is established by setting over the wheelhead.

Two grinding methods are available; in one, the wheel grinds in one direction and is relieved on the return stroke, in the other, grinding is done on both forward and reverse strokes. For close accuracy, roughing is done by two-way grinding, and finishing by one-way grinding.

Indexing for multi-thread worms is usually manual, through accurate index plates, but automatic indexing can be provided, as well as special provision for indexing over a range of starts.

Worm grinders are built by Ex-Cell-O Corp., Jones & Lamson Machine Co., Hanson-Whitney Machine Co., Pratt & Whitney, and Sheffield Corp. On some of these machines the functions are initiated by hand controls, while others are fully automatic in operation, with feed, wheel-dressing and sizing functions performed in proper sequence and arranged to suit the material and operation in process. On completion of the final cut, the wheel is withdrawn and brought to the starting point, thus resetting the machine for the next cycle.

Worm Rolling Equipment

The most recent development for producing worms is by thread rolling machines. Many forms of worm threads have been rolled within the limits of existing equipment and at high production rates. Limitations as now established will be broadened as further experiments and new applications are found necessary and practical.

Worms 4 ft long have been rolled to a lead accuracy of 0.0002 in. in 12 in. Material hardness may vary between 23 and 40 Rc, and a surface finish of 6 to 8 mu in. can be obtained. Three types of thread rolling machines are available: the flat die, the two-roll cylindrical die, and the three-roll cylindrical die. For flat dies a reciprocating mechanism is used, and for the cylindrical dies, rotary motion. To feed the blank, a slight difference in the helix angle of the die advances the work the desired amount. The angle change is governed by the material being rolled, by the size and form of the thread, and the particular specifications to which it must conform.

In general, high pressure angles are desirable, pitch not over 0.125 in., and a maximum of 25° helix angle. Preparation of blanks is an important factor in producing accurately rolled worm threads. The OD of the blank must be in proper relationship to the thread depth and to the type of thread top land required, and must be round and accurately sized.

Machines suitable for rolling worms are manufactured by Acme Machinery Div., The Hill Acme Co., Landis Machine Co., National Machinery Co., Reed Rolled Thread Die Co., Waterbury Farrel Foundry & Machine Co., and Watson Flagg Machine Co. Various methods are used to supply rolling pressure, some machines being mechanical, others hydraulic. Fully automatic, semi-automatic and hand feed machines are available. The type and quantity of work to be produced generally determine the model best suited.

Gear Lapping Machines

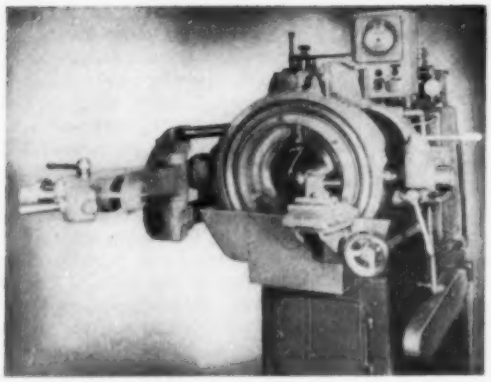
Lapping of gear teeth could be considered an extension of the running-in process for hardened gear teeth. Frequently, soft cut gears and cut gears of large diameter are run together in pairs to correct minor errors and improve finish. To produce similar results when gear teeth are hardened, an abrasive cutting action is required. Lapping machines were developed to meet this demand. The basis of all gear lapping is the cross-axis principle. Variations and methods of application of this principle differ with the variety of equipment available, all of which produce similar results. Rotation and reciprocation of the lap and work, with the abrasive compound applied at the point of tooth contact, produces the lapping action. Resistance to rotation is generally applied to one member in the form of a brake to provide the necessary pressure to keep the teeth in contact and under load. Rotation in one direction laps one side of the tooth surface, while reverse laps the other. Laps are made of cast iron, the abrasive impregnating the active surface of the lap.

Lapping technique takes two forms: One, where the lap and gear are meshed to roll together at the fixed center distance, and the other, cramp lapping, where the lap and gear are meshed tight and the center distance is adjusted to keep the mesh constant. Each method has its purpose, the first for correcting minor errors of tooth form and spacing and for improving surface finish, and the second for correcting run out and out-of-round conditions, or thickness.

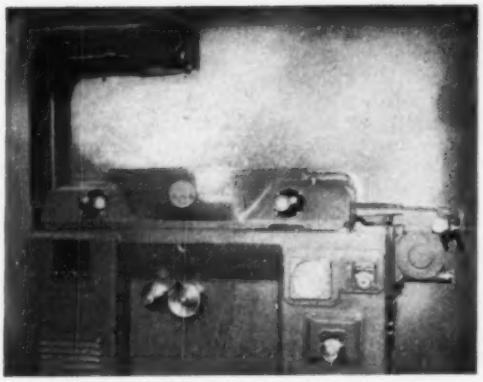
In the Fellows Type L.S., air brakes are used to resist free rotation, and an adjustable relief valve controls the air flow to maintain constant pressure braking. The gear drives the lap, and the rotation and number of reciprocating strokes of the work spindle is controlled independently through change gears. Length and position of stroke is controlled by adjustable crank motion. For internal gears the positions of the lap and gear are reversed, the gear being carried in the head and the lap on the center spindle, the lap thus becoming the driver.

Lateral movement permits gears varying by 3 in. to be lapped with the same lap, or allows recutting the lap to a smaller PD. External helical gears require three laps on the spindles provided in the basic machine, and removal of the detachable head. Helical motion of the work is controlled by guides.

Red Ring lapping machines, built by National Broach & Machine Co., feature a cast-iron lap carried on a lower spindle and driving the work gear on an upper spindle. Rotary motion is through the power drive of the lap spindle, and reciprocating action through the slide carrying the work gear.



Fellows Gear Shaper Type L.S. lapping machine for spur, helical and internal gears, showing the internal, detachable lap head carrying the lap and spur gear mounted on the center arbor. Also shown is the universal work support. Machine is available in four sizes; No. 7 & 10 without detachable head, and No. 8 & 13 with detachable head. These have 5- and 7-in. center distances respectively and cover a range of 2- to 13-in. PD and 1¾ face width



Hydro gear lapper No. 24 produced by Fellows Gear Shaper Co. for internal and external spur and helical gears. Controls are entirely electric-hydraulic. Lap has rotary and reciprocating motion and acts as the driver. Brake pressure on gear is hydraulic. Range of pitch diameters is from 6 to 24 in., and 5-in. face width. Operation is similar to that of type L.S. Cycle is fully automatic and machine stops when lapping is completed

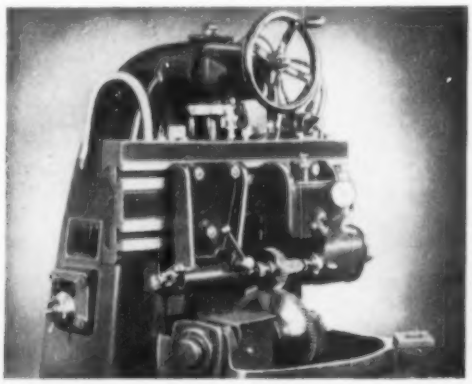
Relation of rotary and reciprocating motion is adjustable to permit any character of cycle.

Michigan Tool Co. produces the No. 995 external and the No. 996 internal machines. The former makes use of two laps, each of which may be set and positioned independently to permit two gears to be lapped simultaneously. Gears may be identical or may have entirely different characteristics. Lapping action may be confined to like or unlike tooth planes.

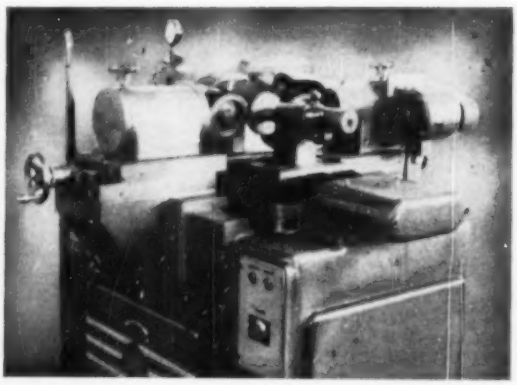
The internal machine employs a single work-driven lap carried on a reciprocating head.

Burnishing Practice

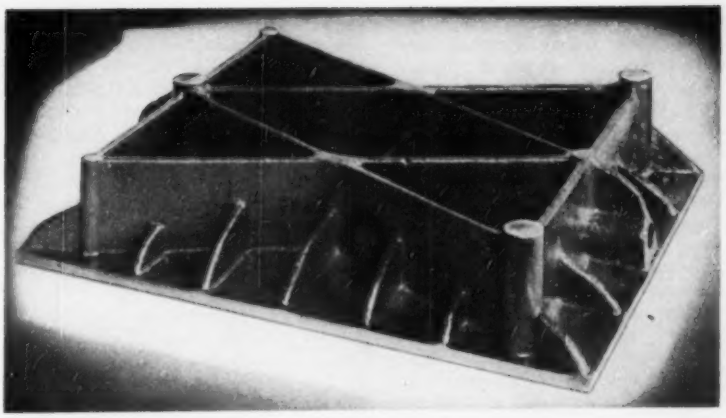
Burnishing is a method of cold working gear tooth surfaces by rotating and rolling under heavy pressure. Usually three hardened burnishing gears are used, with the work set between them. Confined in this way the work gear squares itself and requires no holding tools or arbors. The process is limited in application and can be used only for soft gears. The plastic deformation of the material produces residual stresses, and their release, either by machining, heat treat, or in service, causes severe changes in tooth form and structure.



National Broach & Machine Co.'s Red Ring machine for lapping external spur and helical gears. Cast-iron lap carried on lower spindle drives work gear on upper spindle. Brake pressure to work spindle is hydraulic and adjustable with indicator dial to register pressure. Lap is cut helical and table is rotated through necessary angle to establish required cross axis. Three sizes are available, with capacities from 1 to 18-in. OD, and to 10-in. stroke



Michigan Tool Co. No. 995 lapping machine for spur and helical gears. Two laps are used, employing the crossed-axis principle, the rear lap being the driving member for transmitting rotary motion to the work and second lap. Reciprocating motion is through the work table. Speed of rotation and reciprocation is independently controlled through change gears. Front lap is withdrawn for loading and returns to fixed stop at lapping position



1 **Three-point support** is universally used for surface plates on which flatness of 0.00005 in. per ft has been achieved. With this support there is assurance that in use the plate will be supported in the same manner as when scraped and tested

MACHINE WAYS CAN BE KEPT FLAT

The three-legged milking stool remains steady, no matter how rough the barn floor. Therein lies the answer to an old problem

BY HAROLD S. SIZER
Ass't to Director of Design
BROWN & SHARPE MFG. CO.

MACHINE-TOOL builders have always been faced with the problem of obtaining true ways and flat surfaces, and more than one has made or lost his reputation on his ability to make straight-line motions straight. With the passage of years, the decimal point has been moved over, and strain gages permit accurate measurement of the deviation from straightness, but the problem still exists.

There are two basic, yet simple, design steps which can be helpful in the drive to produce and maintain horizontal flat surfaces. The first step is to use a three-point support. With this the amount of dead weight carried by each foot or support is known and does not change. Roughness of the floor or foundation cannot upset load distribution. Nor can expansion or contraction of the floor, nor heaving or sinking of its surface, change the three-foot loading. Stresses due to dead weight thus remain constant, and the align-

2 **Large surface plate,** weighing five tons and having a scraped surface 120x54 in., is carried on three-point supports. Such plates are among the most trusted reference tools of the machine tool and other industries

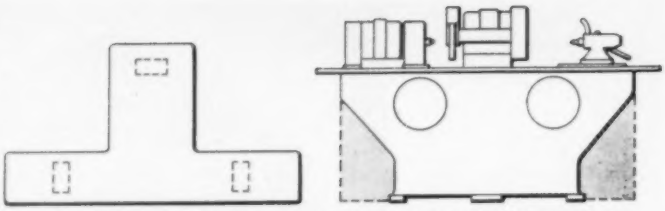
ment or flatness of ways is protected from change. There is no need for delicate screw or spring adjustments. Three feet automatically share the load, and way alignment is not in jeopardy from careless jack adjustments or from failure to make necessary readjustments as the foundation changes. Three-point support is universally used wherever the straightness of an accurately finished surface must be maintained.

Measuring machines and bench centers commonly use a three-point support. These tools must have true ways. A change in the bed support can cause a twist or bend in the way and can upset sensitive measurements. A spectacular demonstration of the disturbing effect of a change in bed support is often made by placing a small plug between the anvils of a measuring machine. Under the normal measuring pressure the plug will be suspended between the anvils, supported by friction. But if a finger is placed under the central section of the bed and lifted lightly, the plug will drop from between the anvils. Light as the finger pressure may be, it changes the support for the bed and causes a change in bed deflection. The three-point support is a simple design step to insure that foot loading will not change.

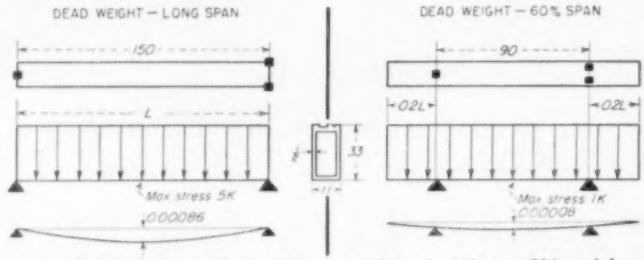
Location of Supports

Having decided to use three-point support, the interesting design problem is where to locate the supports. By picking favorable positions for the feet, bed stresses and deflections can be held to surprisingly low values. In contrast, if the optimum positions are ignored, stresses will be increased, and deflections caused by shifting table or work loads could be serious. The proper location of supports is the second step which can be helpful in obtaining flat ways.

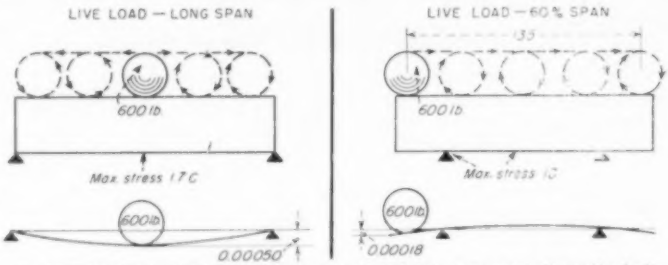
Low casting stresses favor stability, and machine alignments are best protected when steady one-direction stresses are kept low. The maximum stress in a grinding-machine bed, for example, is never high, and from the point of view



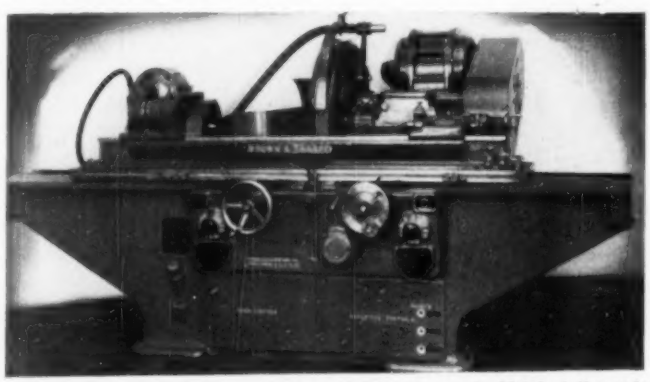
3 **T-shaped bed** is commonly used on cylindrical grinding machines and lends itself readily to the application of three-point support



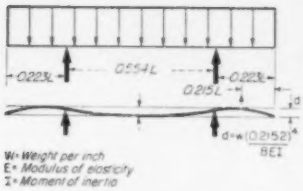
4 **Box-section bed** supported at its ends (left) and at the one-fifth and four-fifths points (right). Stress from dead weight is 5 times as great with the long span between supports, and deflection more than 10 times as great



5 **Movable loads** (tables, footstock and headstock) traversing along the bed cause stresses two-thirds greater when end supports are used. Deflection with load midway between 60% span is only 0.00011 in. and is less than when load is at extreme end of its traverse



6 **Grinder bed castings** are usually tapered at the ends. Metal at the ends makes only a minor contribution to strength and stiffness and can be used more effectively in other sections, or removed altogether to reduce the total weight of the machine



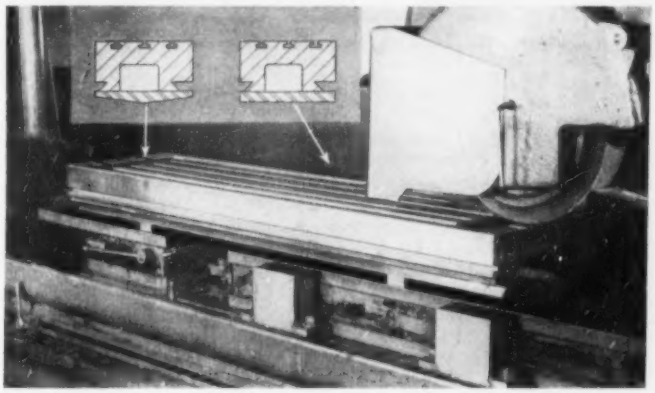
7 **Ideal span** for a simple beam deflecting under its own weight is 55.4% of the length. With this optimum location the maximum deflection is only about 2% of that which occurs with end supports

of strength there is no danger of breakage or failure. Stability or the loss of accuracy resulting from aging of the cast iron, however, is a matter of some concern, and it has been observed that these changes are reduced when stresses are kept low. Although most creep tests are made at elevated temperatures and high stress values, there seems to be a correlation between stress and the amount of creep. In those machine tools where great accuracy is desired, it is a good design practice to keep bed stresses small. The between-the-ends location of supports helps in the design of low-stress beds.

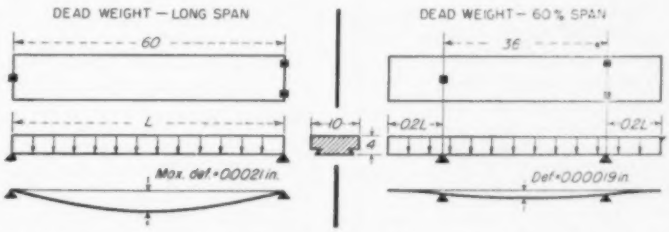
Deflection is a more serious problem to a machine-tool designer than is the problem of stress. Fortunately the good effects of in-from-the-end supports are even more pronounced in the control of deflection than they are in the reduction of stress. If the bed can be machined and scraped in the same position in which it is to be used, deadweight deflections are not too important because flat surfaces can be created. However, the flexibility apparent from deadweight deflection figures permits serious changes in alignment under conditions of a moving load, as is clearly shown in an accompanying illustration.

Grinding machines with way lengths between 60 and 150 in. can be most effectively supported at points which have a span of 50 to 70% of the way length. For beds shorter than 60 in. the depth-to-length ratio for the casting is usually so favorable that supports can be located at or near the ends. For lengths beyond 150 in. the length-to-depth ratio is poor and multiple supports become necessary. In the 60-150 zone the three-point support is ideal. With its use conditions of support come under the machine designer's control. He knows with certainty what conditions of stress and deflection will be, and he knows these conditions will not change when the machine is installed in a new location.

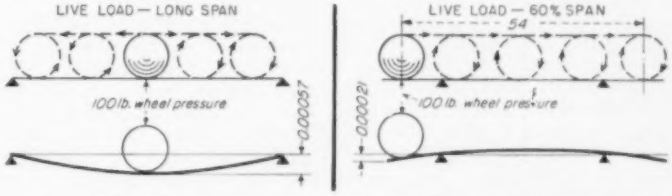
The one-fifth and four-fifths points for support location have been taken as a simple generalization to show the effects produced as supports are moved in from the ends. A 60% span is not necessarily the best. In the case of a moving load, the location of supports is dependent on the length of travel. If the center of a moving load does not come close to the end of the bed, then a lesser span for the supports would be the best solution for greatest rigidity.



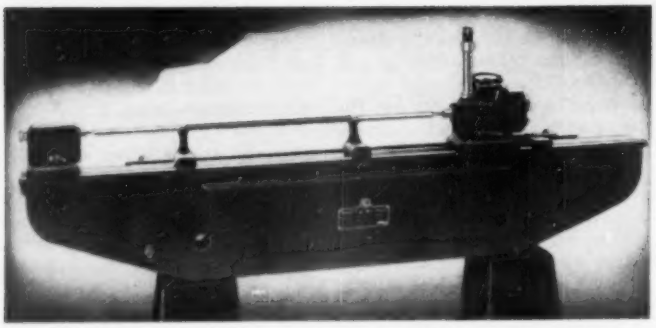
8 **Slightly warped** machine tables will be pulled flat by a magnetic chuck during grinding, but will spring back when check is released. If supported at three points at optimum spacing, table will not be sprung and deflection due to weight and pressure of grinding wheel will be low



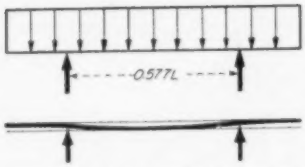
9 **Milling-machine table** supported at its ends can sag 0.0021 in. in the center. Supported at one-fifth and four-fifths points, sag is limted to 0.00019 in. If the work is later turned top for bottom the effects of deflection are doubled



10 **Grinding wheel pressure** can cause deviation from a true flat. Spring pins can be used, but proper location of supports is usually enough. Once a flat surface has been created it may be placed on a flat magnetic chuck so opposite side can be ground and will remain flat



11 **Measuring machine** uses three-point support. With suports well in from the ends, stress and deflection caused by movable measuring heads will be small and alignment of ways can be considered undisturbed. Work is supported in the machine at the Airy points



12 **Airy points** are those support points which will limit deflection of the bar at the center and at the same time permit the ends to remain horizontal. Such support is essential for slender measuring rods, Fig. 11, which would sag and change in length if supported at the ends

Once a design has been studied and the worst loading or working conditions analyzed, then the best location of supports can be determined with reasonable accuracy.

Grinding Long Machine Tables

Although way surfaces on machine tools have traditionally been hand scraped, many of these surfaces are now being ground. On long slender members which sag appreciably from their own weight, it has been a challenging assignment to grind ways with an accuracy equal to, or better than, that obtained by scraping. Such accuracy has been obtained through the use of three-point supports. On members such as machine tables, it is often convenient to determine the best location of supports by an indicator test on a surface plate. With irregular and varying table sections deflection calculations may be lengthy, whereas, deflection measurements can be made quite easily by the use of standard dial indicators and gage blocks.

DESIGN FACTORS FOR PRECISION CASTINGS

Precision casting can be virtually a "miracle" production process for many small components. This is true particularly for parts of intricate shape and design, where resistance to heat, wear, or corrosion is desired and the high melting point, non-machinable alloys are specified.

There are, however, certain limitations that should be borne in mind, according to the Microcast Div., Austenal Laboratories, Inc. These limitations should be considered more as an optimum range for parts to be precision cast, and are:

Minimum weights..2000 per lb.
Maximum weight per casting ..... 1 lb
Longest dimension per casting ..... 8 in.
Thinnest continuous section:
Over very limited areas..... 0.020 in.
For extensive areas..0.040 in.
Thinnest edge:
On an angle of 20°..0.015 in.
On more abtuse angles this thickness may be reduced.

Cores as an Aid

Coring reduces the weight of a casting, thus effecting a saving in the amount of alloy. Cores are often used, therefore, even though the cored hole or recess has no functional purpose.

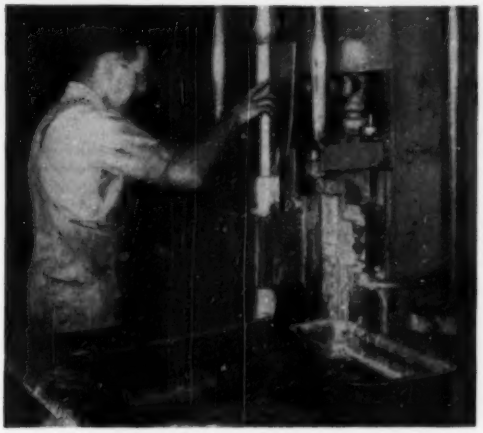
Many components are of such design that feeding is required at two or more locations if proper directional solidification is to be achieved. This adds substantially to production costs. Very often modifying the design of a casting will permit creating or relocating of holes or other coring at these locations, reducing section thickness and eliminating feeding.

Coring vs. Drilling

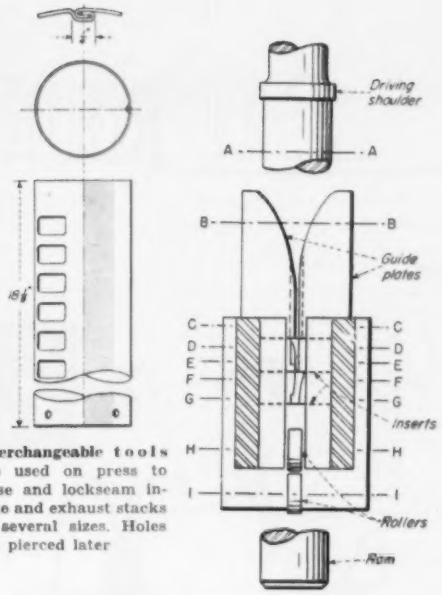
Depending upon the machinability of the alloys involved, round holes often can be drilled more economically than they can be cored. This is especially true of straight, small holes. It is usually possible to obtain higher precision both as regards hole size and location if such holes are drilled rather than cast. When alloys are comparatively difficult to machine, superior economy may be found in coring holes undersize, leaving stock for reaming or broaching.

Threaded Shapes

Special threaded parts can be cast. However, the casting procedure is not sufficiently accurate and does not produce smooth enough threads for most purposes. It is recommended that on surfaces requiring threads, the part be cast oversize and the thread put on by the consumer. A Class 1 fit is ordinarily the best obtainable by casting and in most cases even this requires chasing to produce the accuracy necessary for assembly.



Special 5-ton hydraulic press closes U-shaped part and locks the seam. Operator folds end of piece around piston-rod extension, so bent edges of blank catch behind seaming guides. Collar-type punch pushes on top of blank, forcing it down into cast-iron dieblock. Succeeding piece pushes completed part out of die



Interchangeable tools are used on press to close and lockseam intake and exhaust stacks of several sizes. Holes are pierced later

"ZIPPER" DIE CLOSES AND CRIMPS TUBE SEAM

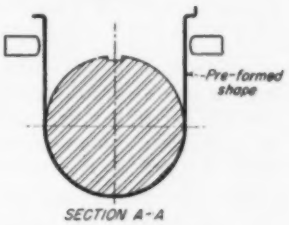
BY H. A. WALDON, General Supt., John Deere Waterloo Tractor Works, DEERE & CO.

INTAKE and exhaust stacks for Deere tractors are formed in two press operations from 0.036-in. thick steel blanks. First operation U's the sheet, bends edges for lock seam. Second operation closes the U to cylindrical shape and locks the seam. Combination of tube closing and seaming operations was made possible through development of a novel "zipper" die.

Tube closing and seaming are performed in a special vertical hydraulic press designed and constructed by Deere engineers. This press has a 44-in. maximum stroke. Cams control an automatic cycle through operation of a Vickers five-way valve. Punch and arbor around which tube is formed are mounted on bottom end of piston rod.

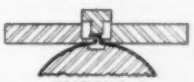
Seam edges are brought together by guide plates above a cast-iron dieblock and close tube around arbor under punch face. Punch forces tube into die where inserts lock the seam. Finished part is forced out of die by next piece.

Separate dieblocks and seam-forming guides are provided for each tube size. Designs of die holder and punch-and-arbor assembly are such that tools can be interchanged easily to make the several sizes of stack tubes needed.



SECTION A-A

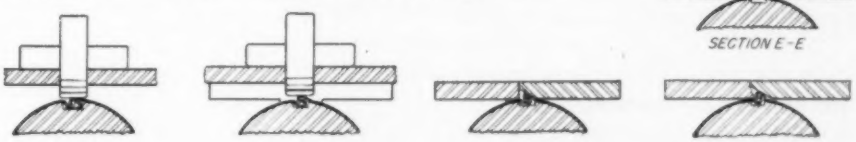
SECTION B-B



SECTION C-C

SECTION D-D

SECTION E-E



SECTION I-I SECTION H-H SECTION G-G SECTION F-F

In principle, the seaming die utilizes chilled-iron inserts that fold over the formed ends of the blank and rollers that iron the seam flat

ROUND TABLE

By Appointment Only

"I see by your bulletin board that you've gone modern on us again," grinned Ed as he dropped into Al's spare chair and propped his feet on the battered desk. "What's all this appointment business—do I have to make one to see you?"

"Not you, Ed," replied Al with a smile. "All that appointment list is supposed to do is to allow me to give my full attention to the men when they need it."

"Don't you think you're going overboard, Al? Some of the gang are liable to think you're going high-hat on them."

"I can't see why they should. When a man wants to see me about something, and I'm busy at the time, he just writes his name on the appointment list. Then, when I'm free, I check the list and go see him. I'm really giving them a break."

"Just how do you figure that, friend?"

"Well, only yesterday I was busy here with some important work, and Tom Simmons came in with a problem. I was thinking of two things at once, so I didn't really give him full attention. I got to thinking about it afterward—which resulted in the appointment list."

"Some result!" cracked Ed. "This squirrel cage is going to look like a doctor's office, with all your patients lined up to show off their symptoms."

"Now don't exaggerate, Ed. The real idea is improved efficiency. I can see a lot more men during the day this way."

"It may be efficient," Ed mused, "but you're losing all the easy-going informality that's pretty important to most of the men I know. They won't be able to just walk in on you like they usually do, and that might lose you a lot of good contact with them."

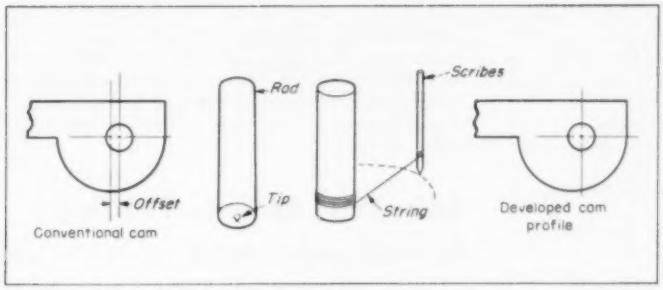
"I don't think so, Ed. This thing ought to work out so I actually have more time with the men—because I won't be wasting time doing two things at once."

"Well Al, I'm against it—your doctor's-office stunt. Better tell the guy you're busy and take the matter up with him some other time."

"Slap the guy down, in other words," Al replied. "No, sir! I believe in treating the men as I'd like to be treated myself."

WOULD FORMAL CONFERENCES, *either in the shop or in the office, put too great a strain on good feeling? Or is time lost in trying to answer two or three questions at once worth the effect of an easy-going routine? Other readers will be interested in your comments. Discussions of earlier topics appear on later pages.*

Practical Ideas



Rapid Layout Method Establishes Quick-Acting Cams

CAMS for assorted sizes and shapes of jigs and fixtures are commonly built in the shops where they are to be installed, but many machinists consider accurate cam layout to be too tough to be worth the bother. Unfortunately, because of this feeling, many cams are made by means of rough methods that only approximate a true cam shape. These often rattle loose when they are subjected to cutter vibrations.

One old approximate method is to scribe a circle that is about the size of the cam desired, then locate a pivot hole slightly off center. This is not usually close enough to give good results.

Another method that is slightly more trouble, but which is a lot more accurate, is to form an involute curve around a center mark. This isn't as difficult as it sounds.

First a dowel is turned with a small center tip at the end. The diameter should be roughly 2/3 of the amount of rise desired in the cam if it is to be turned 180° when it clamps; or twice that amount if the cam is to turn only 90°.

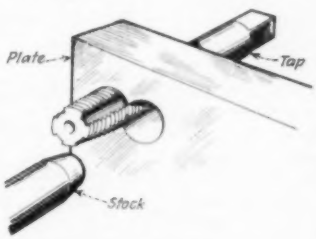
Next a scriber (or pencil) is tied to a string, the center tip of the dowel is set on a scribed center on a piece of stock, and the string is wound (not overlapping) around the dowel until the end of the scriber is brought up to roughly the radius desired on the cam.

Finally the scriber is swung in an arc, controlled by the string, to mark the cam outline.

Actually, the formula for the diameter of the dowel is:

$$\text{Diameter} = \frac{\text{Rise desired}}{3.141} \times \frac{360°}{\text{Angular travel desired}}$$

The layout is then cut out, drilled through the scribed center, and installed. Pressure will develop directly through the cam center when it is clamped; not, as in the case of the off-center hole, to one side of the center. *Frank Biechele, Brooklyn, N. Y.*



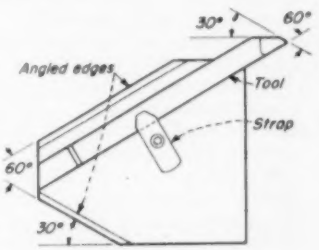
Right-Hand Tap Cuts Left-Hand External Thread

WHEN A SHOP has to put a turnbuckle back into service, and doesn't have a left-hand threading die, someone is likely to come up with a crackpot idea. This one really worked.

A steel plate was drilled and then tapped to a standard half-inch right-hand thread. A second hole, parallel to the first, was then drilled next to it with a small drill, and was then enlarged to ½ in. size. It was located just so the two holes broke into each other slightly.

The tap was replaced in the tapped hole, and the plate was then clamped in a bench vise. The stock that had to have a left-hand thread was tapered down on an emery wheel, and was then gripped with a lathe dog and turned into the non-tapped hole counterclockwise.

The tap struck through into the smooth hole just enough to cut the rod as it was turned, and the result was a left-hand thread for a turnbuckle. *Daniel Love, Worcester, Mass.*

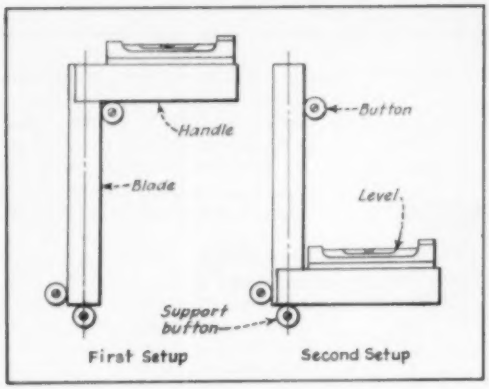


Fixture Block Holds Bit For Grinding Thread Angles

SINGLE-POINT threading tools are quickly ground with a fixture that can be held on the magnetic table of a surface grinder.

The fixture is a block ground to the shape illustrated. A 3/8-in. slot is milled to take a standard lathe toolbit, and a small strap clamp is added to hold the toolbit in position.

Two surfaces of the fixture block are ground off with 5° draft to provide relief on the end of the toolbit automatically. Three surfaces on the end of the toolbit can be ground with the same setup—the only alterations being to shift the fixture under the grinding wheel. *Robert G. Planck, Nutley, N. J.*



Square-Checking Method Requires Buttons and Level

ACCURATE SQUARES should be checked periodically, but most checking systems are laborious, and many are only comparison methods that depend upon the accuracy of a jig or upon feel. The result commonly is that squares are neglected; but this need not be the case if a simple method is followed.

The necessary tools are the machinist's level and a set of toolmaker's buttons, plus some vertical surface that can be left in the setup. This might be the side of a machine-tool housing or an angle plate.

Three buttons are located on the vertical surface in the first illustrated setup. The lower button is centered to support the square, and the other two are positioned so they are separated horizontally by the width of the square and vertically by less than the length of the square. The bubble in the level is centered by adjusting the buttons when the square is in position and the level is resting on its shank.

Next the square is turned over and located in the second position—using the same buttons. The level is relocated on the shank of the square—this time on the reverse edge—but is not reversed itself (not turned from left to right). This insures that any inaccuracy in the level will not affect the test.

If the bubble does not fall at the same spot in the level tube in this position, the square is adjusted by shifting the blade in the shank, or by shimming the blade. Adjustments should be made to return the bubble half way to its position in the first setup.

The square is then changed back to the first setup and checked, corrected, and checked again in the second setup.

Final accuracy depends almost entirely on how closely the bubble is observed, unless the level is unusually crude. The normal machinist's level has a tube that is bent in a 100-ft radius, so it shows up a shift in slant of 0.001 in. per ft with a 0.1-in. movement of the bubble. If the bubble movement is checked no closer than to 0.1 in., the accuracy of the square will be within 0.0005 in. per ft of a true right angle.

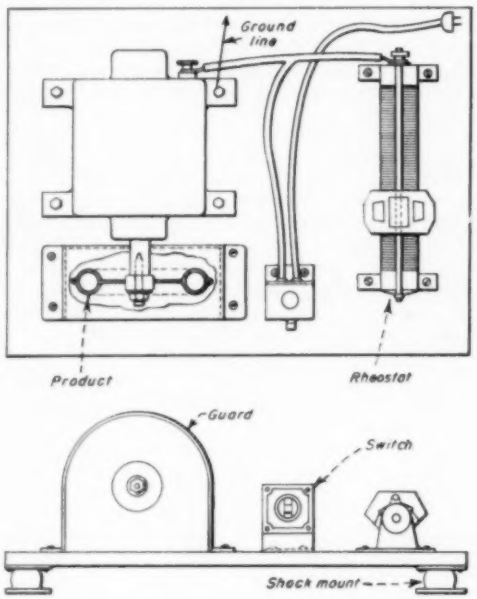
Both the blade and the shank of the square must be within reasonable limits of straightness. To make the check practical, the edges should be at least twice as accurate as the final accuracy of the right angle—or within 0.00025 in. of true straightness. *Michael P. Blake, Charleston, W. Va.*

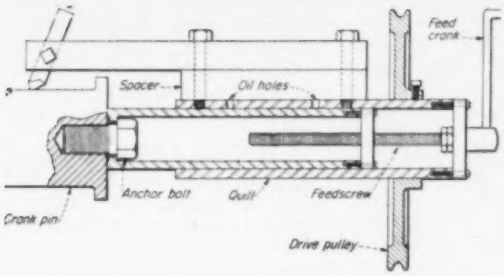
Spin Test Checks Tubing For Liquid Leaks

CENTRIFUGAL FORCE proved to be a practical way to check a product for fluid leaks that developed around a soldered joint at the outside edge of the liquid seal. The part was a circular tube that was sealed before the test.

We employed a series motor, a line rheostat, a switch and line cord, and a sheet metal guard, all mounted on a wood base that was shock-mounted on rubber. The product was mounted on the end of the motor shaft with a stud and nut, and was rotated up to 7000 rpm by varying the rheostat. If no leak developed at high speed—and leaked liquid could be seen on the inside of the guard—the product was good.

Important—NEVER connect a series-wound motor without a load. *Frank J. Peragine, S. Hempstead, L.I.*





Revolving Toolbars Turn Jobs for Maintenance Work

THREE MAINTENANCE JOBS we have done were handled by reversing the normal lathe operation—the tool was rotated around the work instead of the work rotating against the tool.

A crank pin had to be turned down and a new split bearing installed on the crankshaft. To keep the machine in service as long as possible, we made up a cutting tool before the machine was stopped. There was a 1-in. tapped hole in the end of the crank pin, so a pilot was made from seamless tubing to be screwed against the end of the pin. A second piece of tubing was fitted over the pilot to carry a large tool bar and spacer and also a drive pulley that was operated from a small electric motor. This took care of rotating the tool.

The outer end of the pilot was covered with a drilled and tapped plate, and into this a feedscrew was fitted. The end plate in the outer tube was drilled to support the feedscrew. Locknuts and a shoulder on the feedscrew held it in position at the outer plate. As the crank was turned by hand, the feedscrew acted against the tapped hole in the pilot plate to draw the outer tube—and the toolbar—backward; so this took care of feeding.

A new split bearing was made, and then the machine was stopped, the pin was turned with the cranked toolbar, and the new bearing installed.

Another job called for a new 3-in. shaft in a revolving unit in a bake oven. The shaft could not be removed without tearing down a brick wall, so the bearing at the worn end of the shaft was removed and a 1-in. shaft was fitted in a hole in the end of the larger shaft. It was supported outboard by a heavy bracket. The end of the large shaft was turned down with a rig similar to the crank-pin turner, and the turned down shaft was fitted with a sleeve that returned it to its original size.

The third job was a large steam-turbine shaft that had become scored when the end thrust bearing had sheared the key. The bearing was removed and an ordinary lathe toolside was fitted on the frame of the turbine. In this case, normal lathe operation was duplicated—the tool was fixed and the work turned.

The turbine shaft was rotated at a suitable speed by a pipe-threading machine connected to its end, and the toolbit on the slide did the turning in the conventional manner.

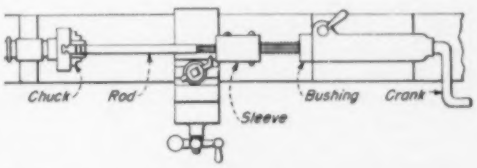
All three jobs show that heavy machinery is not difficult to repair if normal machine-shop operations can be approximated. *Art W. Freeman, Madison, Wis.*

Electro-Etching Restores Files

ORIGINAL SHARPNESS can be restored on shopworn files and rasps by an inexpensive process. Old files are first electro-cleaned in a strong solution of chromic acid.

Files are then dipped in a strong nitric acid solution, and are finally re-dipped in chromic acid again for a final cleaning that restores brightness.

The method is effective because the etching process works most rapidly on the broader surfaces at the roots of the file teeth, and as the sides are reduced, the blunt points become sharp again. The process takes under five minutes to complete, and saves the government about $0.30 on every $0.40 file destined for the scrap heap. *Robert Rohweller, Fairfield-Suisan Air Force Base, Calif.*

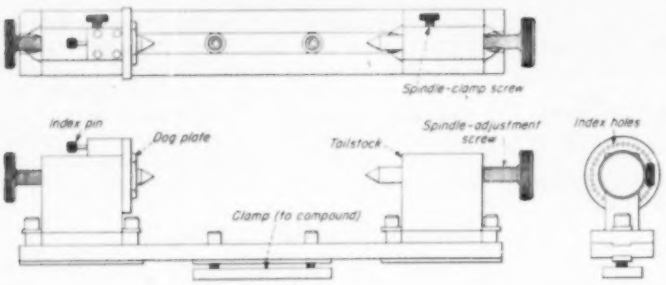


Long Rod Dragged Past Tool To Cut Short Thread Section

HERE IS a somewhat unusual method of cutting a screw thread. The work had to be cut, starting at ½ in. from the right-hand end, for a length of ⅜ in., but my shop had no screw-cutting lathe; and a die would not work at all.

I did the job on a small bench lathe, after I had removed the tailstock center and clamped a tapped bushing in its place. A long rod was bent to crank shape after it had been threaded, and was assembled in the bushing. The workpiece was centered between a short bushing chucked at the headstock and a heavy sleeve that was threaded onto the long crank and pinned in place. A setscrew in the sleeve held it to the end of the work.

As the crank was turned counterclockwise (as viewed from the tailstock end of the lathe), the stock was drawn slowly through the chucked bushing and past the conventional toolbit mounted near the sleeve. The short threaded section was cut with only a few passes. *R. B. Ware, Quincy, Mass.*



Auxiliary Lathe Centers Set Up Milling Work

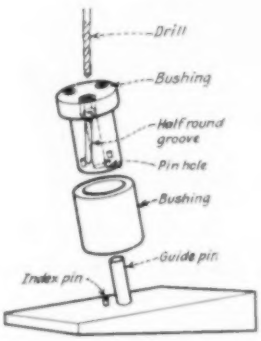
ENGINE LATHES are often required to do milling work—on centers—when the few milling machines in a small shop are busy and there are lathes available. This fixture is designed to fit on the compound rest, where it will hold work between centers. The milling cutter is swung on an arbor that is chucked in the headstock.

Mild steel was milled to form most of the components of the original fixture—these did not need to be hardened. Some standard screws and a spring were utilized, and only an index pin and the two centers were made of hardened and ground tool steel.

The base, slotted to allow adjustment of the centers longitudinally, was bolted to a block that fitted the compound rest. The dimension from the bottom surface of the base to the centerline of the centers was the only critical one—it had to correspond to the size of the compound - to - centerline distance of the lathe for which the fixture was intended.

Thirty-six holes were drilled in the original index plate, at 10° intervals, to be engaged by the spring-loaded index pin. On a smaller circle around the index plate, 9 holes were drilled to take a work-driving dog. The combination of both sets of holes allowed locating work steady at 5° intervals around the circle.

Round work with centerdrilled ends can be milled to flat surfaces on any side with the fixture, and keyway cutting can be handled. The fixture is also useful for holding work that must be drilled crosswise or has to be cut or notched along its length at accurate intervals. *Allan B. Nixon, Springfield, Mass.*



Drillpress Tooling Cuts Oil Grooves in Bushing

SLANTING GROOVES can be cut in brass bushings with an economical drillpress setup that holds the bushing at an angle. The idea behind the oil groove is to have it curve around the ID of the bushing, so the work is set up on a wedge plate.

A guide pin is pressed into a hole and a small index pin is located near the guide pin. Both are perpendicular to the top of the wedge. A flanged plug made from hardened steel has three guide holes through the flange, and also has three index holes in its bottom which will engage the index pin. The bushings and flanges plug (the plug's OD is a few thousandths smaller than the bushing's ID) are assembled and placed over the guide pin.

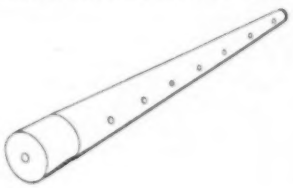
If the flanged plug has been drilled out under each hole in the flange before hardening to a half-circular groove, the drill will cut the other half of the groove in the bushing. Three such holes, located by the index pin in the bottom of the plug, will form oil grooves that will lubricate the bushing when it is in service. *W. C. Braman, Milwaukee, Wis.*

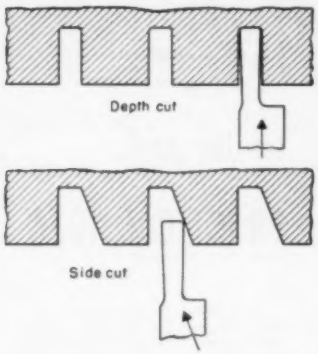
Sample Spring Wound on Tapered Test Mandrel

FINDING the correct mandrel size for a spring-winding job is an annoying and time-wasting chore. The usual hit-or-miss method of cut and try waste stock, and no hard-and-fast rules apply because of the wide differences in stock springback because of differences in material, pitch, and diameter of the spring winding.

A tool I have found helpful is a tapered tool-steel mandrel that has been drilled in a number of spots and hardened. The large end is turned straight for 1 in. so it can be chucked, but both ends are centerdrilled. Holes ($\frac{1}{8}$-in. dia) are spaced 1 in. apart along the mandrel to hold the end of spring stock.

The stock to be wound is started near one end of the mandrel, and is wound along at the correct pitch. A coil is finished and allowed to spring back. The loop with the right OD can be picked and the mandrel can be measured at that point. All that remains is to turn a straight mandrel with that OD. *Charles Schwartz, Brooklyn, N. Y.*





Cutoff Tool Forms Threads

HEAVY WORM and Acme threads are often difficult to cut in hard steel on a small lathe, even when a good form tool is employed. We have a method for cutting such threads without a form tool, and which produces good threads.

First, a cutoff tool is sharpened and ground to the width of thread at full depth. This is set up perpendicular to the workpiece in a toolpost with the compound rest set at half the profile angle of the thread, and the root of the thread is cut.

The right-hand face of the thread is cut by a number of passes with the edge of the tool, which is slightly rounded. The compound feed is used for this. For the left side of an Acme thread, the compound is reversed and set at half the thread-form angle to the left; and a number of passes are made to finish the side of the thread. Final finishing can be done with a file or emery cloth.

Although this method seems long, it does not require a form tool. Actually the number of passes necessary is not much more than would be required with a form tool. *Roger Vicaire, Brussels, Belgium.*

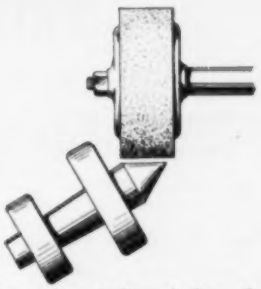
Faceplate Edge Groove-Turned For Indicating Surface

A RECESSED indicating surface can be turned on a faceplate to allow accurate setups. This groove should be about $\frac{5}{8}$ in. wide and $\frac{1}{8}$ in. deep, and smooth. Being recessed, it is protected by shoulders on the faceplate edge from damage during its transfer on and off the lathe. *Edson C. Bates, W. Babylon, L. I.*

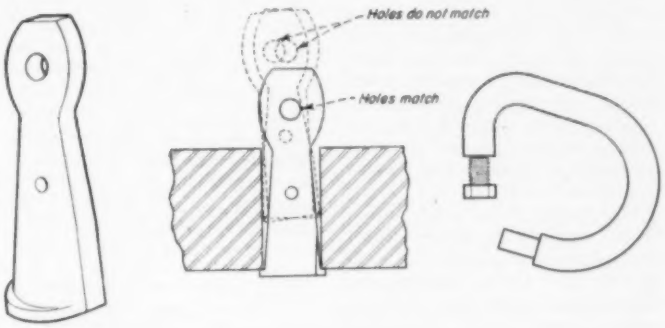
Ball Bearings Hold Center For Bench-Setup Grinding

TWO BEARINGS slipped onto the tapered shank of a lathe center will permit it to be ground quickly by a bench grinder. The bearings are slipped on until they grip the center with their inner races (two different-size rings must be employed), then they are held by their outer races.

If the center is located this way at about the same height as the center of the grinding wheel, all the rough grinding before final grinding on the lathe can be done. A gage will help check the correct cone angle, but this can be judged fairly well by eye.



Both inner races rotate with the center and insure concentricity. *Henry Gifford, Bronx, N. Y.*

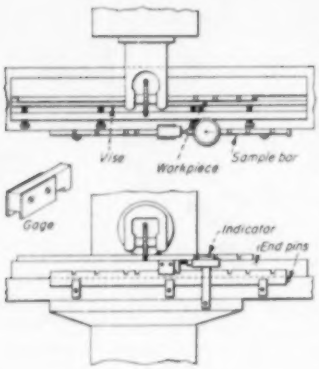


Split Lifting Plug Shifts To Engage Casting Holes

SEVERAL MEN in our shop have been injured when attaching a hook to large castings with center holes by the old method. They had to pry up an edge of the casting, drop a chain from the hook through the hole, then slip a bar through the chain to grip on the under side of the casting. Instead of doing this now, we employ a split plug that will drop into a casting hole and will catch positively with little clearance below the casting.

The plug has two halves that are pinned together to work like scissors. If the turned ears on the lower parts of the plug are brought close together so they will slip into the hole, the hook holes at the tops of the halves will not match and the hook cannot be inserted. Once the ears spread under the casting, the hook holes match and the hook is inserted.

A bolt works in one end of the hook. This can be unscrewed slightly to provide a stop which will prevent the hook from slipping through the plug when the load is raised. In case the casting lies directly on the floor, it can be raised slightly with a crowbar to provide clearance for the end of the plug. *David T. Lyons, Sr., Belmont, Mass.*



Slots in Long Bars Gaged by Sample Part

SEVERAL DUPLICATES of a long, sample slotted bar had to be made. Although all the slots were of the same width and depth, they were spaced unevenly. The job could have been done by measuring the sample and shifting the milling-machine table between slots by reading off the traverse dial, but the method we employed proved to be much faster.

The sample piece was clamped to the front of the table, located against a pin at one end. A long vise to hold the workpieces was bolted down on the machine table exactly parallel to the sample, and a milling cutter of just the same width as the slots was set up.

We located the table for each new cut by means of a dial indicator mounted on a support from the knee of the machine. A small gage made from scrap stock was set in a slot in the sample, and the table was shifted until the gage hit the dial-indicator spindle and turned it to zero. The table was then stopped and raised into the cutter to produce the slot.

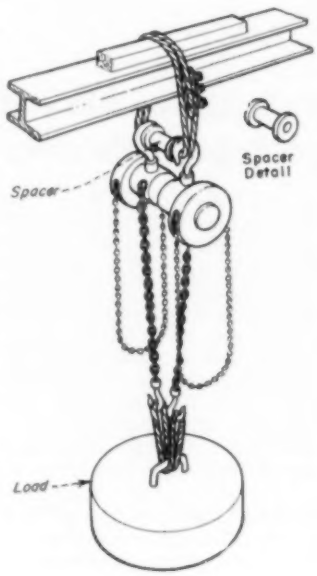
Setup was made with the gage on the right-hand end of the sample part, the table traversed to the left, and with the dial reading zero. The first workpiece was slipped into the vise and against the left face of the cutter, and a pin was located in the vise to position all the other pieces at the same place. This made location of each subsequent workpiece in correct relationship to the sample and the dial indicator. *L. Kasper, Philadelphia, Pa.*

Double-Hoist Rig Lifts Heavy Shop Loads

HEAVY LOADS in a shop sometimes are too great for the largest available equipment, but in such cases two chain hoists can be hitched together to balance the load.

Often this is tried by hitching one hoist to each end of the load, but such arrangement requires two operators and a lot of false starts. A better way to hitch two hoists of equal capacity to one load is to hook them onto a chain over a beam. They should be separated on the chain by a collar or spacer.

A chain or rope should be wound over one hook, down through a support on the load, up over the other hook, back through the load support, and back to the first hook. Pulleys can be used here if desired —the rope arrangement is a standard pulley rig—but are not necessary because the rope should not move. *Pablo Redl, Buenos Aires, Argentina.*



$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER— Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER— Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

95th Winner:

Basil Clark

Standardized Clamp Blocks

NEWS OF METALWORKING

Tool Show Is "Must" for Production Heads Seeking Ways to Cut Costs

PHILADELPHIA — For production executives and shop men looking for ways and means of cutting manufacturing costs the ASTE Industrial Cost-Cutting Exposition here April 10-14 is a "must." Some 300 exhibitors are presenting cost-cutting ideas in Convention Hall and Commercial Museum buildings.

New machine tools will be shown, of course, plus new presses for innovations in sheet metal fabrication, new ideas to cut die costs, new spot welding ideas, and similar developments.

But that's only part of the story, for the processes and equipment on exhibition—many in operation—include such diversified fields as grinding; innovations in machine controls in line with the trend toward automation; new ideas to reduce wear of machine tool parts; all kinds of new machine tool accessories to improve their performance; new developments in cutting tools to reduce machine down-time, reduce tool cost, and increase production.

Materials Handling Devices

There are developments specially relating to the greater use of mechanical devices for materials handling. Heat-treating is represented with improved furnaces. Several new basic materials are being introduced. Finally, the job of reducing assembly time by greater production accuracy is reflected by development of many new types of inspection and checking methods and equipment.

Among the machine tools, there is a new multiple spindle drill press on which up to five spindles can be used in any position from a little over 3 in. to over 7½ in. apart. There are jig borers with infinitely variable speeds—from 90 to 2400 rpm, thread rollers that will handle bars up to 4 in. dia and threads up to 8 pitch.

One device shown reduces the number of machining setups required, makes possible milling or grinding on lathes, boring and drilling on milling machines without removing the work.

A drilling machine for small holes consists essentially of a high-speed motor and rotary air compressor on the same armature shaft. It operates either completely or semi-automatic.

Grinders to precision finish such materials as sapphires and norbide are there. A tool grinder that may be used as a surface grinder, a chip breaker grinder or a universal tool and cutter grinder will be introduced.

Forming Die Costs Reduced

To reduce forming die costs for applications where runs are short there is a new process by which one section of the panel can be formed or drawn at a time, and the sheet then rotated to form and draw a second section.

Major stress is given to carbide tools at the Exposition. Among the newer types of carbide tools are several carbide milling cutters with blades which can be sharpened without removing them from the body, the blades being interchangeable over a wide range of cutter sizes, thus reducing tool cost as well as grinding time.

A new type of free machining steel will be introduced nationally for the first time at the Tool Show. Hardenability is said to be the same as AISI 4150.

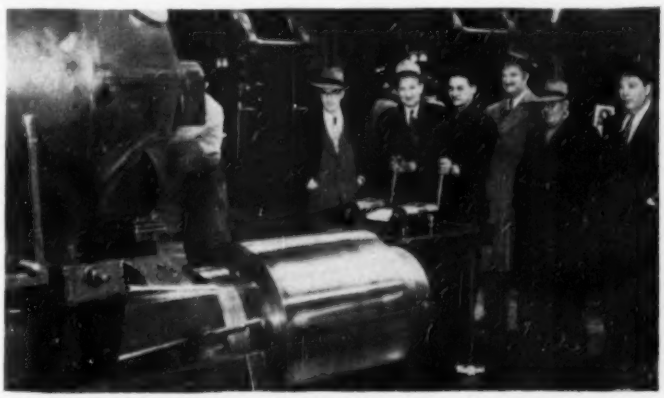
Materials handling developments at the Show include a punch press feeding device to transfer parts from a nesting plate into the punch press die by means of mechanical and vacuum operation.

Curtis W. McGraw Named New Head of McGraw-Hill

Curtis W. McGraw has become president and chairman of the McGraw-Hill Publishing Co., succeeding James H. McGraw, Jr., who has resigned. He is a son of the founder, has been connected with McGraw-Hill since 1920 when he joined the McGraw-Hill Book Co. Twenty years ago he was named a director of the publishing company, and since 1943 has been vice president and treasurer.

James H. McGraw, Jr., had been associated with McGraw-Hill for 35 years and had guided its operations for the past 20 years. It was during his term as chief executive officer that the company expanded substantially in both domestic and international fields.

Colonel Willard Chevalier has been named to the new post of executive vice president of McGraw-Hill. He has been affiliated with the company for 28 years as editor, publisher and company executive. Joseph A. Gerardi will succeed Curtis McGraw as treasurer.



***FIRST SALES CONFERENCE SINCE 1938** brought together in Chicago, New York and Cleveland some 400 salesmen of American Steel & Wire Co., a U. S. Steel subsidiary. F.O.B. prices and other causes today make a much more intensive-type job of selling necessary, salesmen were told. Here a group of salesmen watch a roller operate a cold-roll strip machine at the Cuyahoga Works of American Steel & Wire Co., Cleveland*

Electrical Industry Wages Will Be Influenced By GM Settlement

WASHINGTON—More than ever before, the major wage settlement in the electrical industry this year will be influenced by what happens at General Motors. This may mean that Westinghouse and General Electric will have to grant bigger concessions than otherwise.

How closely these companies will have to follow General Motors will hinge on how big a chunk the new CIO, International Union of Electrical Radio and Machine Workers is able to take away from the left-wing United Electrical, Radio and Machine Workers (ex-CIO).

James B. Carey, director of IUE-CIO, followed up his sweeping election victory in the five GM electrical plants with a mutual-aid pact with Walter P. Reuther's CIO automobile workers. It provides that neither union will settle with GM without the other's approval.

Carey will then try to force the same settlement in those Westinghouse and GE plants in which he is able to take bargaining rights away from the UE. Elections have not been held yet in Westinghouse and GE, where contracts expire April 1. Thus, the GM settlement, barring a strike or postponement, will likely come before Westinghouse or GE.

New Sales Agents...

Geoffroy Co. will represent Colonial Broach Co., Detroit, as sales engineers in Colorado, Utah and Wyoming. It also will handle drill jig bushings, steel stamps and marking devices produced by Colonial Bushings, Inc., and New Method Steel Stamps, Inc. Headquarters are: P. O. Box 67, Capitol Hill Station, Denver 6, Colo.

Birdsboro hydraulic presses and related equipment will be handled in southern California and Arizona by Miller-Joyce, Los Angeles, and in New England by Whitty Engineering Co., Boston. J. R. Allen Co., Cleveland, will act as agent for Birdsboro steel castings in Ohio, except for a few eastern countries.

Wegner Machinery Corp., Long Island City, N. Y., will be exclusive representatives for Bliss mechanical and hydraulic presses in southeastern New York State, northern half of New Jersey and northeastern Pennsylvania.

Robert Kuntz, 1217 East Third Street, Dayton, Ohio, is now representing in a sales and engineering capacity the Kelly Reamer Co., Cleveland, in southwestern Ohio.

G. W. Brunton & Son, Kenmore, N. Y., and **H. A. Smith Machinery Co.**, Syracuse, N. Y., have been appointed sales agents in the Buffalo-Rochester and Syracuse areas respectively for Ferracute power presses.

Hartford Special Machinery Co., Hartford, Conn., has appointed these sales agents: Woodall Engineering & Sales Co., Dayton, Ohio, in southern Ohio; McBeth Machinery Co., Pittsburgh, in western Pennsylvania; Garco Machinery Co., Cleveland, in northeastern Ohio; Ray H. Farmer Co., Detroit, in Michigan; and Luther Pedersen, Inc., Chicago, in Wisconsin, Iowa, Illinois and Indiana.

Science Foundation May Pass

WASHINGTON—The National Science Foundation bill seems destined at last to become law, after five unsuccessful attempts in five years. This is the organization that would stimulate basic research and supply scholarships to promising students. NSF bills have passed both the House and Senate, though with differences.

Both Senate and House have provided for a full-time director responsible to the President. President Truman vetoed the bill once because it didn't.

Industrial Shorts...

Kroehler Mfg. Co., Cleveland, maker of living room furniture, will soon start production of new types of welded steel furniture frames which will replace much of the wood formerly used. With the change, Kroehler will turn out 25,000 upholstered sofas or chairs a week, compared with current rate of 15,000.

First capacity operation since the war of the Jones Mills, Ark., aluminum reduction plant of Reynolds Metals Co. will be reached late in March, as result of availability of new power sources. Plant has annual capacity of 144 million pounds of aluminum.

New department for experimenting with manufacture of electric metallic tubing by induction welding is being installed by Mahoning Valley Steel Co., Niles, Ohio, General Electric subsidiary. A light wall pipe or tube for encasing electric wires in factory and commercial buildings will be made. A tube mill and plating line have been purchased for this department.

Riverside Metal Co., Riverside, N. J., has expanded mill facilities so that it now can supply nickel-silver and phosphor bronze alloy wire as small as 0.005 in. in diameter and rods as large as $4^{3}/_{4}$ in. New facilities include new casting equipment, annealing furnaces and materials-handling units, in addition to wire drawing and rolling mill equipment.

Do Owners Control Coal Output Now? Depends on "Good Faith" of Miners

WASHINGTON—Whether the coal operators really have regained control of mining production in their new agreement remains to be seen.

The "able and willing" clause has been knocked out and a "good faith" clause inserted. But compliance with the contract still rests on the good faith of John L. Lewis and his miners. The operators have waived any right to file suits for damages against the United Mine Workers for any breach of contract.

Assuming "good faith" compliance by Mr. Lewis and his miners, the industry will be assured of steady coal production until next April, little more than a year. The agreement is for more than two years, until June 30, 1952, but it may be terminated or amended after next April 1.

Mr. Lewis won: (1) an increase from $14.05 to $14.75 in the miner's daily wage; (2) a royalty boost from 20 to 30 cents a ton for the pension and welfare fund; (3) control of the welfare fund of about $140,000,000 a year through the appointment of his friend, Miss Josephine Roche, former mine owner, as "neutral" trustee. Miss Roche has been director of the fund under appointment by Mr. Lewis.

The operators were able to: (1) eliminate the "able and willing" clause which permitted the miners to set aside the contract at will, thus letting Lewis decide when the miners would work; (2) limit "memorial periods" of idleness to five days a year; (3) render the union shop null and void when, as expected, the Supreme Court upholds the National Labor Relations Board decision in the captive mine case of 1948 that the union shop clause violates the Taft-Hartley law.

Taxes and "Social Gains" Sending U. S. Down Road to Obsolescence

ANNAPOLIS, Md.—This country is steadily going down the road to obsolesence "because we are draining out of our enterprises in taxes, in dividends and for 'social gains' the earnings that should go back into better machines and better methods," Tell Berna, general manager, National Machine Tool Builders Association, told an audience at the U.S. Naval Post-Graduate School here March 7.

Speaking on "Leadership in Management," he suggested six important responsibilities of management, one being "to secure public acceptance of the company, as a defense against harmful government action." The other five responsibilities:

1. To formulate sound policies for the enterprise.
2. To change them to suit changed conditions. To widen and develop the company's market.
3. To develop junior executives so as to insure continuity of management.
4. To set up adequate channels of information and adequate records.
5. To reduce costs by standardization, better equipment, better methods, better training and more effective cooperation within the organization.

Elaborating on his fifth point, Mr. Berna said that "it is part of the responsibility of management to keep its productive facilities at top competitive efficiency. It is easy to assume that a machine tool is a source of profit merely because it is in good running order and is causing no trouble. But what if a new machine or a new method has been devised that will do the work faster and more accurately? To retain the old machine is to keep costs up when they can be lowered. It is to lose an opportunity for profit. It is also depriving the public of a saving in price."

Yet, he pointed out, the American Machinist's Mid-Century Inventory of Metalworking Equipment shows that "we have 379,000 machine tools in the United States today that are over 20 years old. . . . This means that they were made in the era of mushet steel and high speed steel, and we are now in the era of sintered carbides."

Ask Fair Dealings

Referring again to the six important responsibilities of management, Mr. Berna said: "If we require all this of the manager, he has a right to ask in return that he be dealt with fairly, that Government will not step in to weaken the discipline in his organization by unwise and biased labor laws and regulations, nor follow a tax policy that drains the very life blood out of his enterprise. He should be told definitely what the rules are to be."

Labor Notes ...

UAW-CIO stands to add 11,000 members from the expulsion of the mine, mill and smelter workers from the CIO. Seventeen formers MMSW locals in copper and brass smelting plants in New England, New Jersey and Pennsylvania are dickering to switch their affiliation to UAW-CIO. Temporarily, they are attached to the CIO shipbuilding workers as the Progressive Metal Council.

Unions expect more favorable NLRB decisions now that Paul L. Styles, former AFL official, is on the Labor Board. Styles' vote can upset the Board's recent decision that a worker does not have to join the union under a union shop so long as he offers to pay initiation fee and dues.

The four-week coal strike increased sentiment among miners in the captive pits to switch to Phil Murray's steel union. But Mr. Murray, former vice president of the miners, isn't encouraging the idea.

Look for NLRB General Counsel Robert N. Denham to step out of his controversial job by the end of the year. His replacement will be more palatable to organized labor, more lenient in applying Taft-Hartley against unions. Employers will get less considerate treatment.

New Naval Laboratory To Pretest Weapons

WASHINGTON—A laboratory which specializes in destroying the products of other laboratories—saving the government millions of dollars in the process—will be dedicated at the White Oak, Md., Naval Ordnance Laboratory, March 23. The new facility, a $4,000,000 installation to be known as the Ordnance Environmental Laboratory will devote its efforts to scientific destruction of weapons and weapon components for the Navy's Bureau of Ordnance.

Through the use of the facilities found in the new Naval laboratory Navy scientists will be able to subject any Naval weapon to all probable conditions which it might experience from the time it leaves the manufacturer's loading platform to the time it explodes against its target.

***GENERAL MANAGER** of Caterpillar Tractor Co.'s new plant to be located two miles southwest of Joliet, Ill., is T. R. Farley, vice president. The company has acquired some 300 acres of unimproved land on which it will immediately start construction of a factory in which will be made a large portion of the company's line of bulldozers, scrapers, wagons and rippers.*

Plant Expansions ...

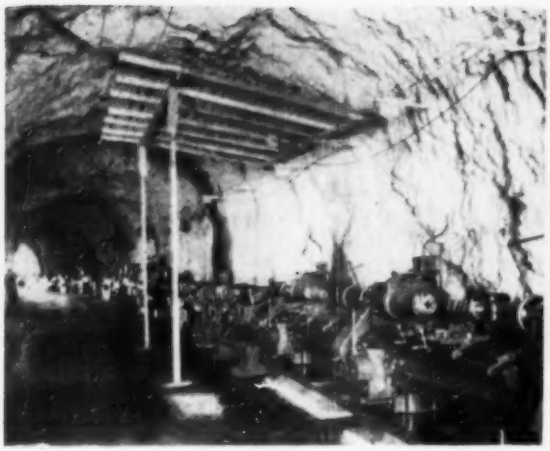
Follansbee Steel Corp., Pittsburgh, has an expansion program under way in the Metal Warehouse in Rochester, N. Y., involving a move to larger warehouse quarters at 961 Lyell Ave., increasing floor space by 75% and storage by 350%. The warehouse is scheduled for completion in 60 days.

Minnesota Minning & Mfg. Co., St. Paul, Minn. has purchased 26,000 sq ft of additional office and warehouse space in Detroit at 8825 Grinnell Ave. Two buildings and nearly four acres of land are included in the property.

John Hewson Co., New York, has expanded its Rubber and Plastic Division to handle all standard and special application problems of its customers, with Harry Bradbury as specialist and consultant in charge.

Osborn Mfg. Co., Cleveland, has purchased for $200,000 a four-story building adjoining its Cleveland plant, with 77,600 sq ft of floor space —an increase of 30% over present production space. The building will house the technical dept., and contain all machines, tools and laboratories need to supply technical service to industry.

Texas Engineering & Mfg. Co., Inc., Dallas, has received from Super Vend Sales Corp., Chicago, largest order ever given for production of soft drink cup-vending machines. The contract will involve several million dollars of production business for Temco during the current year.



LATHES and other machine tools in the seven-mile-long tunnel factories in Riva, Italy, operated by the Fiat Co. to produce airplane engines for the German army

OFFICE in the underground V-1 robot bomb factory in Escherhausen, Germany. Plant was manned by slave laborers, mostly Italians

War Plant Dispersal Favored Over "Digging In"

All Available Areas in United States Cataloged; Germans Had 143 Factories in Production Below Surface

WASHINGTON—Disperse, or dig in, for plant protection in World War III? Concentrate on establishing all new vital wartime facilities away from heavily industrialized areas, or follow the lead of Germany and Japan as illustrated in the World War II photographs above?

That's the problem industrial and military leaders are weighing in today's thinking about defenses in another war. Plant dispersal appears to be favored, for practical reasons. But the military mind is not closed to possibilities offered by digging in to underground plants.

"Dispersal" does not mean taking a plant in Cleveland or Detroit or Bridgeport and moving it lock, stock and barrel to Nashville, or Houston, or Albuquerque. As Munitions Board Chairman Hubert E. Howard stated in a letter to the International Association of Machinists, answering a union resolution which expressed opposition to dispersal of defense industries (*AM*, Dec. 29, 1949, p. 95), "The Department of Defense program for dispersion of United States industries is to encourage vital facilities to separate major industrial plants by at least a few miles." The program, he said, is "to disperse within areas and not to disperse from one area to another."

It's industry's job, the National Security Resources Board has stated, for the government can neither dictate nor finance dispersion. But NSRB will help, and has issued an official pamphlet, "National Security Factors in Industrial Location." Purpose: to "describe the nature of the risk of a possible enemy attack against industry and to indicate some action which industry might feasibly take."

Some dispersion of industry has already taken place. The National Industrial Conference Board in a survey made last year of 1948 manufacturing companies found that one-fourth of them had definite policies on decentralizing plant facilities and that about half of them had already in fact decentralized.

What about underground plants? The thinking in Washington seems to be to place underground only those plants of top strategic value, although nothing official has been issued on the underground planning part which could be of value to industrial managers.

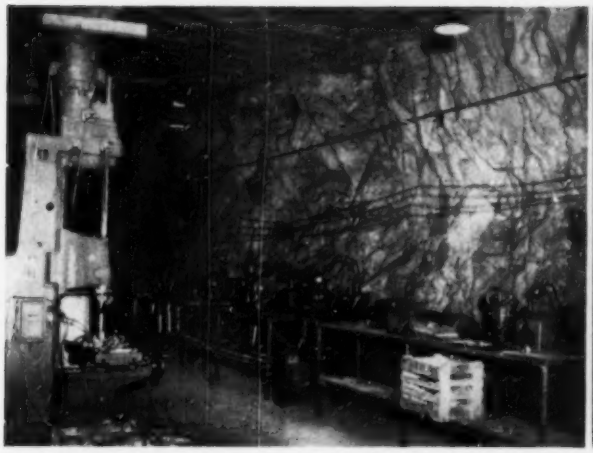
Compared to construction of underground facilities, NSRB considers dispersion the more practical. Among other things, underground plants cost more. It isn't only the underground part of the plant, but the above-ground facilities that are necessary. Resort to this type of security, the NSRB believes, will probably be economically justifiable only in connection with such highly strategic facilities as may be determined by the armed forces.

Underground plant possibilities are not being neglected by the government. The Army Engineers two years ago cataloged all available underground areas, both natural and man-made. Included were caves and salt, zinc, copper and limestone mines. The underground site survey disclosed the availability of several hundred million square feet of usable underground space in existing mines.

German and Japanese experience with below-surface installations has been studied, and correlated with the Army Engineers' studies here. The German plants, especially, have been thoroughly investigated first by military authorities and then by industrial investigators sent to Europe by the Department of Commerce.

When World War II ended the Germans had 143 underground factories in production. Nearly 60% of airplane engines were produced underground.

At Munich, four semi-underground Messerschmitt plants were



DRILL PRESSES and a variety of small, specialized machine tools filled this section of an underground factory at Thils, France, where parts for flying bombs were made

SMITH & WESSON underground plant at Springfield, Mass. Picture shows one of many ramps leading to subterranean working areas

But Army Also Studies Underground Protection

built. Two factories near Niedersachwerfen in the Hartz Mountains were situated beneath a steep, heavily-wooded hill that rose almost 300 feet above the surrounding countryside. The main tunnels were about 30 ft wide and 24 to 30 ft high with nearly vertical walls and domed ceilings.

In Austria, a larger Messerschmitt factory, built in 13 months, and covering an underground area of 12 acres, produced about 1000 jet-propelled planes by war's end.

Railway and highway tunnels were pressed into service and old mines were converted by the Germans to avoid digging.

At Kahla, a factory in a mine was scheduled to produce fighter planes, and a tunnel factory at Leonberg and Eschenlohe made parts for engines. In Italy the Germans converted the numerous highway tunnels cut through the hills around Lake Garda into tunnel factories. Operated by the Fiat Co., the plants produced airplane engines.

The Japanese also used old mines and worked-out quarries. One underground engine factory located in a rock quarry near the Japanese town of Oya had a total area of 537,000 sq ft. Plans called for making 300 Nakajima engines a month, but production for the three peak months of 1945 averaged only 70.

We know that the Germans and the Japanese stopped building underground plants when the war ended, but little is known about the other countries. Sweden continued construction of underground plants after VE-day and today a number are in operation.

At Torshaella the Bolinder-Munktell airplane motor and tractor factory is completely underground. Only a small shack on the side of a mountain gives an indication of the plant site.

In the United States a $400,000 planning contract for underground factories was awarded to an engineering firm headed by Guy B. Panero right after the end of the war. A report made last year by the firm to the Army has not been made public. But, it is known that two specific installations were planned in detail. One is a manufacturing unit, the other a chemical process plant.

Only two underground installations used for purposes which exist in wartime can be found in the U. S. One is a government cold-storage warehouse built in a worked-out limestone mine at Atchison, Kansas. It was used during the last war as a food storage warehouse by the War Food Administration.

Smith & Wesson's small arms plant at Springfield, Mass., is the other installation. It is believed to be the first underground "factory" in this country, having been built during the last war when it became apparent that the firm's 100-year-old plant was wholly inadequate for an all-out war production effort.

The need for some planning of underground protection is felt by many businessmen, but they are doing nothing because of lack of a definite policy statement from the government. Of a number of proposals of financing the plants of obvious strategic value, none have reached the serious stage.

One proposal is to have the government finance the extra cost resulting from underground construction.

Another suggestion is to have the government build a number of these underground plants to be kept in a standby condition and leased to operating companies in case of war.

No matter how financed, there is a feeling that perhaps several "typical" underground plants should be built in this country to act as pilot models.

Limitations of underground facilities must be recognized, on the other hand. Not only will manufacturing be greatly hindered, but the interdependence of plants and processes will be brought out. A plant must be able to get raw materials and ship out its production.

The Germans, for example, had overestimated their ability to defend the transportation facilities leading to the underground sites and the Allied capacity to keep transportation arteries disrupted. The plants themselves were almost completely invulnerable.

Detroit

AUTO WORKERS HAVE NEW CONCEPT OF YEAR-TO-YEAR RAISES
OUTLOOK FAVORABLE FOR CUT IN CAR AND TRUCK EXCISES

Don't figure that an end to the Chrysler strike means a serene labor season in Detroit. General Motors contract negotiations will be initiated at the turn of April by the CIO United Auto Workers—and stormy weather lies ahead.

UAW is driving for a union shop in GM; it wants to succeed this year. General Motors is just as determined to resist that demand to the utmost. Some expectations are that this battleground of principle will be more keenly fought than the economic demands of the union.

And those economic demands are hardly minor. The union wants a pension basis of $125 a month—even though the Chrysler issue began over $100 benefits. On top of that, UAW has a new concept of inherent year-to-year raises. They should equal 3%, that body feels.

What does this amount to? In 1948 and 1949 the GM "annual improvement" raises were 2% or 3¢. The union says the company therefore "owes" it 1½¢ for each year—plus 5¢ for 1950. Total: 8¢. Beyond that are fringe issues equaling at least another penny. Add to that the 23¢ value of the pension demand, and you'd raise GM pay from a going average today of about $1.62 up to $1.93.

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If present conditions continue, UAW may have a potent weapon at hand when the bargaining begins with GM. Auto sales are booming. Wayne County (Detroit) deliveries during the first two months of 1950 were 25,095 cars, 1,955 trucks—compared with 17,332 and 1,519 respectively last year. Proportionate increase: More than 43%. Used car sales practically doubled.

Chevrolet and Olds had their best February showings in history. Chevrolet moved 134,622 cars and trucks—about 30,000 more than in February 1941, the previous peak. Olds sold 31,560 cars, nearly double the best previous February showing, last year.

Elsewhere it's about the same. Those sales figures are mirrored in factory output figures—around 125,000 a month in all U. S. and Canadian plants. The coal strike settlement came just in time to avert serious cutbacks. It did not come soon enough, however, to stop the crimp in overtime schedules.

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What goes for autos goes for tires. Early March saw U. S. Rubber go onto a 7-day basis of operations at Detroit, its casing and tube headquarters. Reason? January and February sales were highest for those months in company history. The rest of the tire industry had about the same results.

High volume means production cost amortization at rapid rates. That accounted for the recent Studebaker price reductions. It helped make Hudson price cutbacks possible. It made easier the GM decision to slice $10 to $40 off its cars starting March 1, when wage levels declined 2¢ an hour under the cost-of-living agreement with the UAW.

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More on Ford's continuing program to increase its production potential: At Canton the forge plant is now making spindle supports and steering arms for Mercury and transmission sliding gears for tractors; soon truck ring gears will be coming. A central service parts depot will be built west of Detroit, containing almost a million sq ft of floor space. These are in addition to the plans announced in January for a production foundry and motor plant at Cleveland.

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Elsewhere in the automotive world, International Harvester plans a $6,500,000 engineering development plant for Fort Wayne, to house all engineering administration work. Nash is rapidly equipping its new assembly plant at Toronto; Canadian-built Nash cars will shortly be rolling.

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Here's what it takes to get into the automobile business on the scale of Chrysler Corp.—24,300,000 sq ft of floor space, 23,276 machine tools. Total suppliers: 6,500.

• • •

Automotive companies are watching Washington and excise taxes. In the hullabaloo about removal of excises, nothing was said for a long time about car and truck taxes. The Automobile Manufacturers Assn. has now jumped in with both feet. Result: A favorable possibility that when excises are cut back or removed, those on automotive vehicles will also get full consideration.

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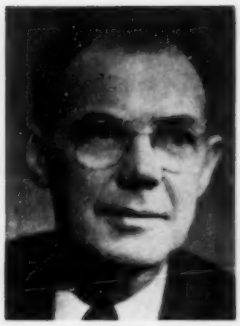
Statistics of early March: Total registered vehicles (as compiled by R. L. Polk & Co., Detroit) are 39,818,351 as of last July—an all-time high. New car registrations last year were 4,406,872, new trucks 961,961. The passenger car figure is a record; trucks, however, fell behind 1948. Scrappage of cars in 1949 came to 1,220,041 cars, 484,038 trucks—a figure well below average on cars, indicating that the backlog of should-be-junked automobiles is still increasing.

Eugene A. Coombs



Robert H. Bruce

H. Walter Regensburger

Joseph G. Brady

Names in the News

Eugene A. Coombs has been named export sales manager, Gisholt Machine Co., Madison, Wis., and will take up temporary residence in Paris, France. **Robert H. Bruce** is assuming Mr. Coombs' former duties, and is now assistant general sales manager.

Selby Frank, Leslie E. Simon, Ray M. Hare, and **Joel G. Holmes** have been appointed brigadier generals of the Army Ordnance Dept. Gen. Frank is now in command of Red River Arsenal; Gen. Simon is director of Ordnance Research and Development and formerly head of the Ballistics Research Laboratories at Aberdeen; Gen. Hare is in charge of general supply for Ordnance Field Service; and Gen. Holmes is field director of ammunition plants, Joliet, Arsenal, Ill.

William B. McFerrin has been named division executive vice president, and **Robert M. Briney** has been named division vice president in charge of Wrought Alloy Products, Haynes Stellite Div., Union Carbide & Carbon Corp., Kokomo, Ind.

H. Walter Regensburger has been named chief engineer, general engineering dept., Link-Belt Co., Chicago. He succeeds **Harry L. Strube,** retired. The department has been transferred from Philadelphia to 301 West Pershing Road, Chicago. Assisting Mr. Regensburger will be **Charles M. Young, Jr.,** as chief developmental engineer, and **Harold F. Watson** as chief standards engineer.

Arthur L. Fleck has been named general sales manager, American Screw Co., Providence, R. I. He succeeds the late **Charles O. Drayton.**

William Webster has been named to head the Research & Development Board, Dept. of Defense. He is executive vice president, New England Electric System of Boston.

Maj. Gen. John K. Christmas has been named to head the procurement group in the Logistic Div. of the General Staff.

Allen B. Wilson has been elected vice president in charge of special products, and **Alex L. Moll** vice president in charge of strip steel sales, Acme Steel Co., Chicago.

Joseph G. Brady has been named New York district sales manager, small tools and gages, Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn. He succeeds **J. C. Molinar** who recently became sales manager of small tools and gages. Recent additions to the machine tool sales staff of the New York office are: **John R. Batterson, Harry Randall,** and **Denison C. Fuller.** Added to the machine tool sales staff at Chicago is **Arthur J. Laducer;** and to the San Francisco and Los Angeles branches, **P. D. Brown.**

Henry B. Ahlers has been named assistant to the vice president and general manager, Industrial Products Divisions, Westinghouse Electric Corp., Pittsburgh.

Donald K. Rennie has been named works manager, American Brakeblock Div., American Brake Shoe Co., New York. **James W. Green, Jr.,** has been named superintendent of Brakeblock's Winchester, Va., plant, succeeding Mr. Rennie there.

Ernest R. Baxter has been named assistant vice president, Carborundum Co., Niagara Falls, N. Y. **Frederick W. Bonacker** has been named general sales manager, and **Fred W. Scott, Jr.,** sales manager, Coated Products Div.

William B. McFerrin

Robert M. Briney

Ernest R. Baxter

Frederick W. Bonacker

Arthur Keating has been elected president, National Enameling and Stamping Co., Milwaukee. National Enameling accepted the resignations of **Stevens A. Bennett** as president and director and **John W. Cavanaugh, William H. Saunders, Jr.,** and **John N. Marshall** as directors. Board vacancies were filled by election of **Francis W. Magin,** president of Square D Co., Detroit; **Anthony von Wening,** vice president of A. O. Smith Corp., Milwaukee; **David G. Baird,** financial consultant, New York City; **Cornelius Ross,** insurance executive, New York, and **David Graham,** attorney, Chicago. **Alfred J. Kieckhefer** remains as chairman of the board.

Roland J. Schmitt has been named manager, New York territory, E. C. Atkins & Co., Indianapolis, succeeding **E. S. Norvell,** who will retire May 1.

F. W. Marschner, administrative assistant to the general manager, New Departure Div., General Motors Corp., has retired after 35 years with the firm.

("Names" Continued on p. 206)

***TINNERMAN SPEED NUT FASTENERS** will be produced in a new Australian plant, it has been announced. Plans for production were made in Cleveland recently by W. J. Burnell (left), chief engineer, and L. G. Oxford (right), technical director of Simmonds Aerocessories, Ltd., Tinnerman Products' licensees in Great Britain. The two executives are shown above with George A. Tinnerman, vice president and general manager of the Cleveland firm*

Business Items

Pacific Car & Foundry Co., Seattle, has begun construction of a $300,000 addition which will greatly diversify its steel fabricating facilities. Equipment to be housed in the new 85 x 420-ft. building includes automatic welding machines, Gantry power riveting machines, and new plate shearing and forming equipment.

Patterson Foundry & Machine Co., East Liverpool, Ohio, has opened a new plant at Toronto, Canada, erected for the company's subsidiary, Patterson Foundry & Machine Co. (Canada) Ltd.

United Engineering & Foundry Co., Pittsburgh, has purchased Stedman Foundry & Machine Works, Inc., Aurora, Ind. Operations will continue at Aurora.

Micro Drill Guide & Engineering Co., Detroit, has been organized with offices at 18515 Weaver St. The firm manufactures small hole drill guides and serves as consulting engineers on grinding methods.

Towmotor Corp., Cleveland, has opened a factory sales and service branch in Oakland, Calif., with Gordon Winters in charge. The new branch is equipped to service all maintenance requirements of fork lift trucks.

Hydropress, Inc., New York, in the near future will operate the rolling mill business of Loewy Construction Co., Inc., New York, as the Loewy Rolling Mill, Division of Hydropress.

SKF Industries, Inc., has received an order for 23 tons of anti-friction bearings to be installed in a hot strip mill in the heart of France's Lorraine iron ore basin. The order was placed by United Engineering & Foundry Co., Pittsburgh, which will construct the mill for Societe Lorraine de Laminage Continue (Sollac). It calls for 76 spherical roller bearings for the mill's drives and pinion stands.

Machined Steel Castings Co., Alliance, Ohio, has ceased operations as a result of a stockholders' decision. Lack of orders and adverse conditions in the steel industry were blamed for the shutdown.

Westinghouse Electric Corp., Pittsburgh, has been awarded a $400,000 contract by E. W. Bliss Co., Salem, Ohio, for motors and auxiliary equipment for a new rolling mill in Italy.

Carborundum Co., Niagara Falls, N. Y., has started production of "Carborundum" silicon carbide in a new plant in Vancouver, Wash., costing over $2 million.

Drafting Associates, Inc., Bristol, Pa., has moved to larger quarters at Lincoln Ave. & Pond St.

S-K-C Research Associates has been formed with laboratories at 445 Fifth Ave., Paterson, N. J., for research, technical consultation and development in powder metallurgy, process and plant design, mechanical, chemical and metallurgical engineering. Principals are John D. Shaw, Walter V. Knopp, and Catherine L. Clark.

Clipper Diamond Tool Co., Inc., New York, has named Sminkey & Haas, Chicago, as distributor.

Obituaries

Dr. Horace W. Gillett, 66, former director of Battelle Institute, died March 3. He was internationally known as an authority on metallurgy. At the time of his death, he was serving as a technical consultant to Battelle. In 1910 he was made manager of the research dept., Aluminum Castings Co., Detroit. In 1912 he became associated with the U.S. Bureau of Mines as an alloy chemist and twelve years later became chief, Div. of Metallurgy, U.S. Bureau of Standards.

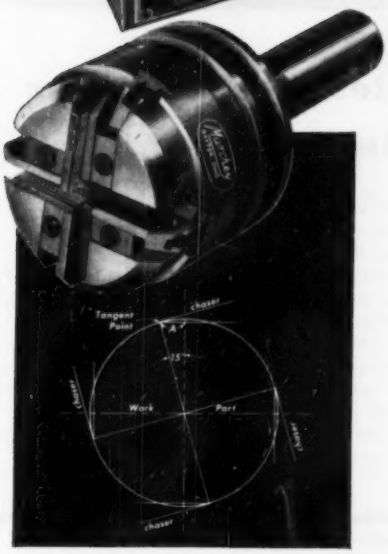
Albert W. Sensel, 68, retired toolmaker and former owner of North Dayton Machine Tool Co., died Feb. 22 in Dayton, Ohio.

William J. Donkel, 63, president of Kent-Owens Machine Co., Toledo, died March 3. He went to Toledo in 1922 to assist with reorganization of the Kent-Owens firm. In 1927 he became president. Previously he was a consultant engineer for Winchester Repeating Arms Co., New Haven, Conn., and a management consultant with Stevenson, Jordan, Harrison, Inc., New York.

William M. Levyn, 73, founder and former president of Acme Electric Welder Co., Vernon, Calif., died March 1 in Los Angeles.

NO CHASER-WASTING REGRINDS WITH THIS MURCHEY TEAM

Simply "clean up" your chasers as required, and RESET to cutting position instead of REGRINDING



This Murchey Micrometer Setting Fixture assures each chaser being set accurately in its holding block, precisely positioned to the ideal cutting point. Then, when the blocks are placed in the Murchey Tangent Die Head, each chaser bears an equal amount of the cutting load. No cutting edge works harder or wears faster than another.

This Fixture will handle both right and left hand holding blocks for all Murchey Tangent Chaser Die Heads.

ADVANTAGES

Murchey threads are accurate and uniform.

More threads can be cut between chaser adjustments.

Wear is equal on all chasers.

Chasers in Murchey Tangent Die Heads outlast others many times.

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Lower cost per thread . . .
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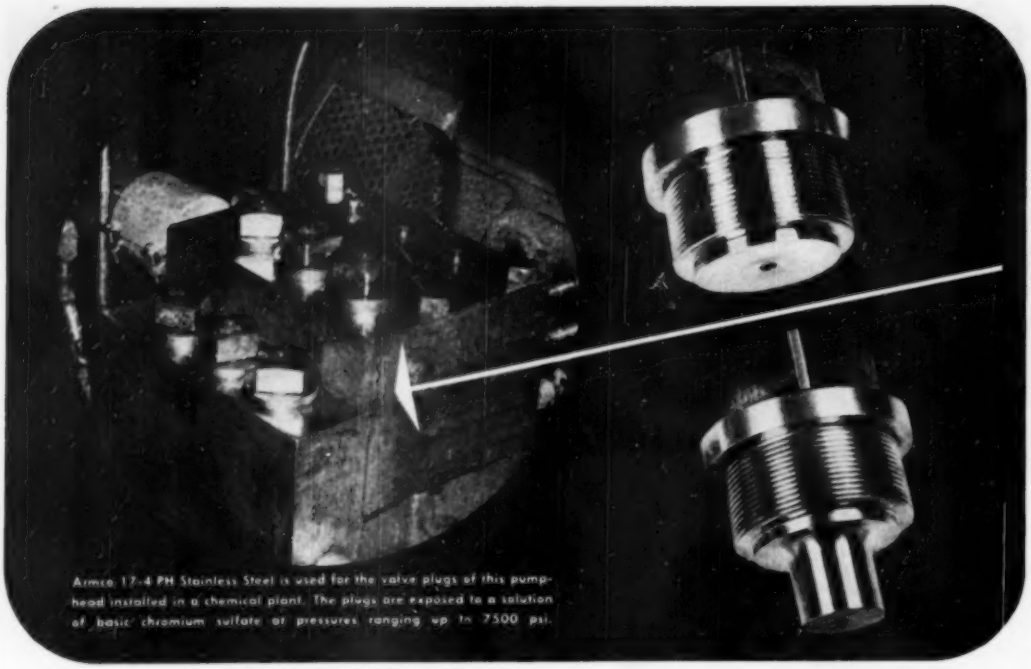
Use Murchey collapsible taps, self-opening die heads (tangent and radial chaser types) and special threading tools



Armco 17-4 PH Stainless Steel is used for the valve plugs of this pump-head installed in a chemical plant. The plugs are exposed to a solution of basic chromium sulfate at pressures ranging up to 7500 psi.

Heat-treat this stainless for hardness after finish-machining

New Armco 17-4 PH Stainless Steel (a precipitation hardening grade) offers you many cost-saving advantages. One of the most important is the ***low-temperature*** heat treatment that gives your products hardnesses of Rockwell C40 to 45. Yield strengths range from 170,000 to 200,000 psi.

Heat treating in the low-temperature range of 850° to 900° F. does the job.

This means you can finish-machine precision parts ***before*** hardening. In fact, you get rid of finishing problems all along the line. There is no danger of cracking or distortion. No scaling either, and no stress-relief treatment is needed. Only an easily-removed heat tint results from the hardening operation.

Both the machining characteristics and corrosion resistance of Armco 17-4 PH Stainless Steel closely approach the 18-8 grade.

Production men report excellent results with Armco 17-4 PH in the production of gears, cams, shears, pinions, chains, valve plugs, shafting, special nuts, bolts, fasteners, and precision instrument parts.

If your products need high strength and hardness, or they can be made more salesworthy with the good corrosion resistance offered by Armco 17-4 PH, write for more information about this newest Armco special-purpose steel. Just fill in the handy coupon and drop it in the mail.

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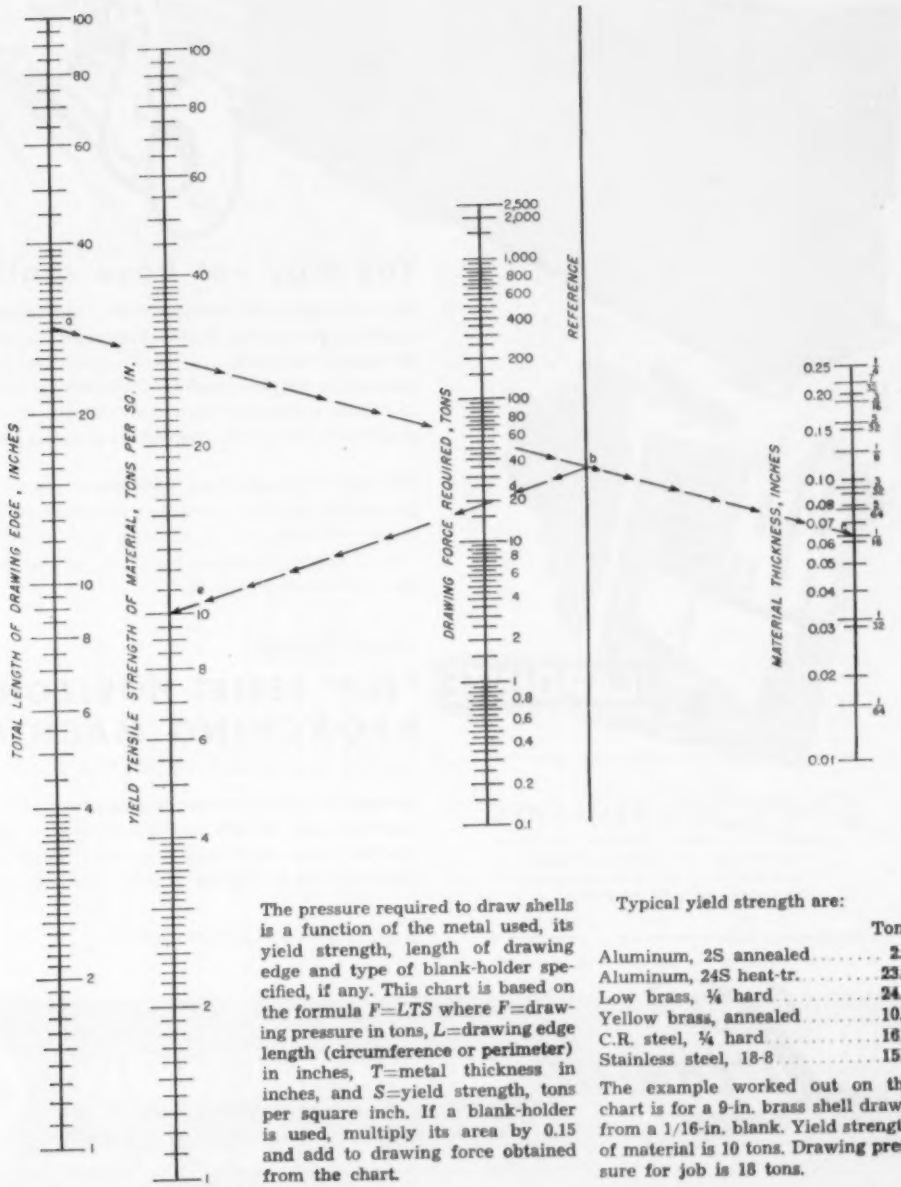
REFERENCE BOOK SHEET

Estimating Drawing Pressure

BY TYLER G. HICKS


TOTAL LENGTH OF DRAWING EDGE, INCHES
YIELD TENSILE STRENGTH OF MATERIAL, TONS PER SQ. IN.
DRAWING FORCE REQUIRED, TONS
REFERENCE
MATERIAL THICKNESS, INCHES

The pressure required to draw shells is a function of the metal used, its yield strength, length of drawing edge and type of blank-holder specified, if any. This chart is based on the formula $F=LTS$ where F=drawing pressure in tons, L=drawing edge length (circumference or perimeter) in inches, T=metal thickness in inches, and S=yield strength, tons per square inch. If a blank-holder is used, multiply its area by 0.15 and add to drawing force obtained from the chart.

Typical yield strength are:

	Tons
Aluminum, 2S annealed	2.5
Aluminum, 24S heat-tr.	23.0
Low brass, ¼ hard	24.5
Yellow brass, annealed	10.0
C.R. steel, ¼ hard	16.0
Stainless steel, 18-8	15.0

The example worked out on the chart is for a 9-in. brass shell drawn from a 1/16-in. blank. Yield strength of material is 10 tons. Drawing pressure for job is 18 tons.

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are made in 8 standard sizes ranging from 2½ to 50 Ton capacity, and 30-inch to 78-inch stroke. Our new Bulletin gives engineering data and complete specifications on the H-P Series. May we send you a copy?

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A tentative standard produced under the auspices of the Metal Cutting Tool Institute, The Society of Automotive Engineers, National Machine Tool Builders' Association and the American Society of Mechanical Engineers.

Size Drill	Regular Shank			Shank Smaller than Regular			Shank Larger than Regular		
	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.
1/16	1	5 1/16	1 7/16	....	....	....	....	....	....
53/64	1	5 3/16	2 1/16	....	....	....	....	....	....
27/32	1	5 3/16	2 1/16	....	....	....	....	....	....
55/64	1	5 3/16	2 1/16	....	....	....	....	....	....
7/8	1	5 3/16	2 1/16	....	....	....	....	....	....
57/64	1	5 3/16	2 1/16	....	....	....	....	....	....
29/32	1	6	2 3/16	....	....	....	....	....	....
59/64	1	6	2 3/16	....	....	....	....	....	....
15/16	1	6 1/16	2 3/16	....	....	....	....	....	....
61/64	1	6 1/16	2 3/16	....	....	....	....	....	....
31/32	1	6 1/16	3	....	....	....	....	....	....
63/64	1	6 1/16	3	....	....	....	....	....	....
1	1	6 3/16	3 1/16	....	....	....	....	....	....
1 1/64	1	6 3/16	3 1/16	....	....	....	....	....	....
1 1/32	1	6 1/2	3 1/4	....	....	....	....	....	....
1 3/64	1	6 3/4	3 1/2	....	....	....	....	....	....
1 1/16	1	6 3/4	3 1/2	....	....	....	2	7 3/16	3 1/2
1 5/64	1	7	3 5/8	....	....	....	2	7 1/2	3 5/8
1 3/32	1	7	3 5/8	....	....	....	2	7 1/2	3 5/8
1 7/64	1	7 1/4	3 7/8	....	....	....	2	7 3/4	3 7/8
1/8	1	7 1/4	3 7/8	....	....	....	2	7 3/4	3 7/8
1 9/64	1	7 1/2	4 1/8	....	....	....	2	8	4 1/8
1 5/32	1	7 1/2	4 1/8	....	....	....	2	8	4 1/8
1 11/64	2	8 1/4	4 3/8	1	7 3/4	4 3/8	....	....	....
1/2	2	8 1/4	4 3/8	1	7 3/4	4 3/8	....	....	....
1 9/64	2	8 1/2	4 5/8	1	8	4 5/8	....	....	....
1 13/32	2	8 1/2	4 5/8	1	8	4 5/8	....	....	....
1 29/64	2	8 3/4	4 7/8	1	8 1/4	4 7/8	....	....	....
15/32	2	8 3/4	4 7/8	1	8 1/4	4 7/8	....	....	....
1 31/64	2	8 3/4	4 7/8	....	....	....	....	....	....
1 1/2	2	8 3/4	4 7/8	....	....	....	....	....	....
1 33/64	2	8 3/4	4 7/8	....	....	....	....	....	....
17/32	2	8 3/4	4 7/8	....	....	....	....	....	....
1 35/64	2	8 3/4	4 7/8	....	....	....	....	....	....
9/16	2	8 3/4	4 7/8	....	....	....	....	....	....
1 37/64	2	8 3/4	4 7/8	....	....	....	....	....	....
19/32	2	8 3/4	4 7/8	....	....	....	....	....	....
1 39/64	2	8 3/4	4 7/8	....	....	....	....	....	....
5/8	2	8 3/4	4 7/8	....	....	....	....	....	....
1 41/64	2	9	5 1/8	....	....	....	3	9 3/4	5 1/8
1 21/32	2	9	5 1/8	....	....	....	3	9 3/4	5 1/8
1 43/64	2	9 1/4	5 3/8	....	....	....	3	10	5 3/8
1 11/16	2	9 1/4	5 3/8	....	....	....	3	10	5 3/8
1 45/64	2	9 1/2	5 5/8	....	....	....	3	10 1/4	5 5/8
1 23/32	2	9 1/2	5 5/8	....	....	....	3	10 1/4	5 5/8
1 47/64	2	9 3/4	5 7/8	....	....	....	3	10 1/2	5 7/8
3/4	2	9 3/4	5 7/8	....	....	....	3	10 1/2	5 7/8
1 49/64	2	9 7/8	6	....	....	....	3	10 5/8	6
1 25/32	2	9 7/8	6	....	....	....	3	10 5/8	6
1 51/64	3	10 3/4	6 1/16	2	10	6 1/16	....	....	....
1 13/16	3	10 3/4	6 1/16	2	10	6 1/16	....	....	....

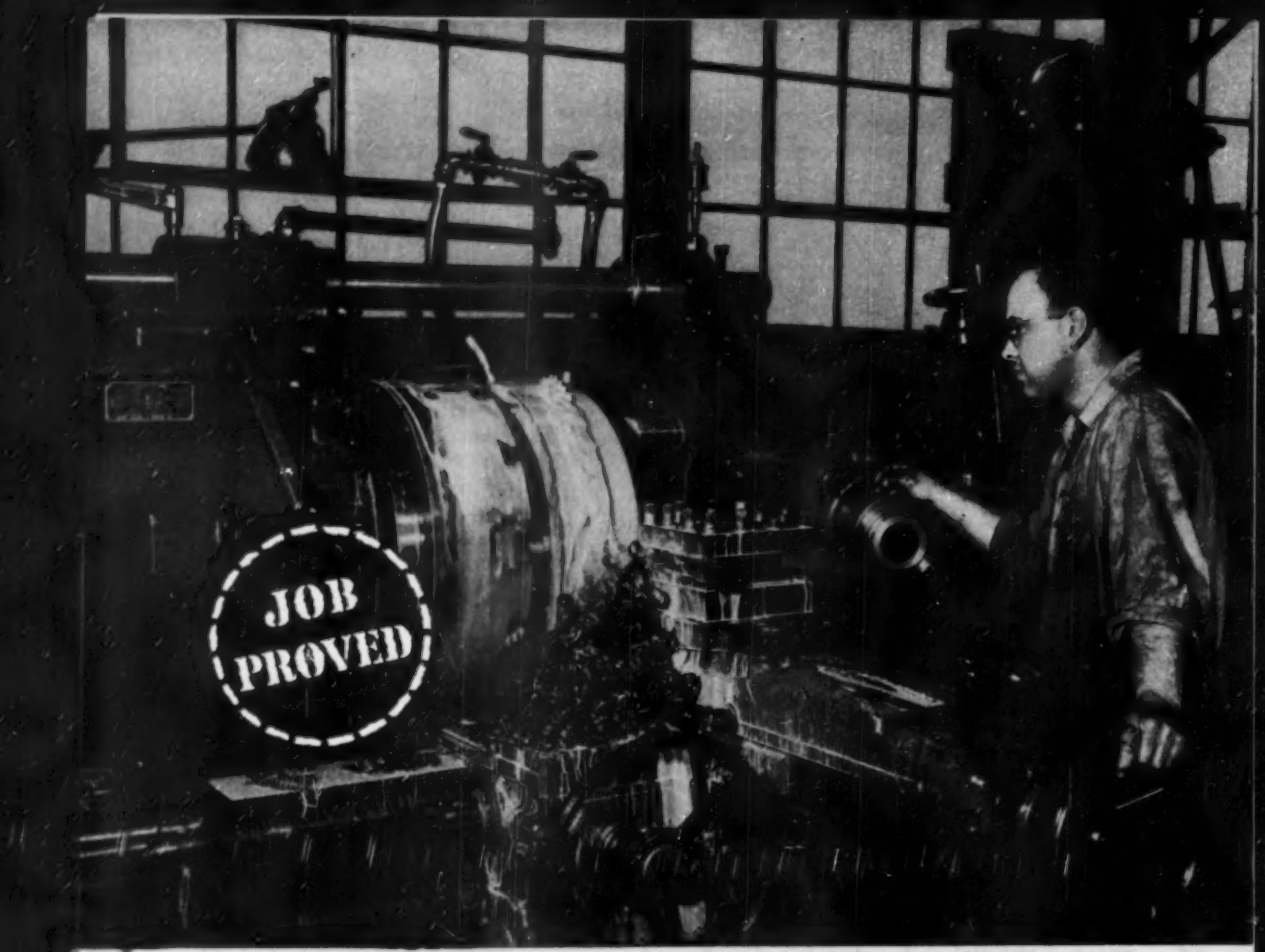
Size Drill	Regular Shank			Shank Smaller than Regular			Shank Larger than Regular		
	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.
53/64	3	10 3/4	6 1/16	2	10	6 1/16	....	....	....
27/32	3	10 3/4	6 1/16	2	10	6 1/16	....	....	....
55/64	3	10 3/4	6 1/16	2	10	6 1/16	....	....	....
7/8	3	10 3/4	6 1/16	2	10	6 1/16	....	....	....
57/64	3	10 3/4	6 1/16	2	10	6 1/16	....	....	....
29/32	3	10 3/4	6 1/16	2	10	6 1/16	....	....	....
59/64	3	10 3/4	6 1/16	....	....	....	....	....	....
15/16	3	10 3/4	6 1/16	....	....	....	....	....	....
61/64	3	11	6 3/16	....	....	....	....	....	....
31/32	3	11	6 3/16	....	....	....	....	....	....
63/64	3	11	6 3/16	....	....	....	....	....	....

TOLERANCES

Element	Range	Direction and Tolerance
Drill Diameter	1/16	+0.0000 to —0.0008
	Over 1/16 to 1/4 incl.	+0.0000 to —0.0010
	Over 1/4 to 3/4 incl.	+0.0000 to —0.0015
	Over 3/4 to 1 1/2 incl.	+0.0000 to —0.0020
	Over 1 1/2 to 3 1/2 incl.	+0.0000 to —0.0025
Drill Over-all Length	1/16	+1/16 to —1/16
	Over 1/16 to 1/2 incl.	+1/8 to —1/8
	Over 1/2 to 1 incl.	+1/4 to —1/4
	Over 1 to 2 incl.	+1/4 to —1/4
	Over 2 to 3 1/2 incl.	+3/8 to —3/8
Drill Flute Length	1/16	+1/8 to —1/16
	Over 1/16 to 1/2 incl.	+1/8 to —1/8
	Over 1/2 to 1 incl.	+1/4 to —1/4
	Over 1 to 2 incl.	+1/4 to —1/4
	Over 2 to 3 1/2 incl.	+3/8 to —3/8
Back Taper*	Up to 1/16 incl.	0.0000 to 0.0008 in. per in.
	Over 1/16 to 21/64 incl.	0.0002 to 0.0008 in. per in.
	Over 21/64 to 1/2 incl.	0.0002 to 0.0009 in. per in.
	Over 1/2 to 3/4 incl.	0.0002 to 0.0011 in. per in.
	Over 3/4 to 21/32 incl.	0.0002 to 0.0012 in. per in.
	Over 21/32 to 1 1/2 incl.	0.0002 to 0.0015 in. per in.
	Over 1 1/2 to 3 1/2 incl.	0.0002 to 0.0020 in. per in.

All dimensions are given in inches.

*The broad range of back taper permits the engineering design of various manufacturers to fall within the limits, without forcing the manufacturer to conform to any particular practice. The back taper per inch range indicated is provided for manufacturers' engineering practice only, so that selection may be made from within this range best to suit his practice.



S.E.C.O. BEATS COSTLIER CUTTING OIL

Competitive Product Fails to Match Fine Record of Sunoco Emulsifying Cutting Oil in Cost or Performance

For 27 years a metalworking shop used Sunoco Emulsifying Cutting Oil with complete satisfaction on difficult operations. The following is a typical example:

Machine: Gisholt turret lathe, model 4L.
Parts: 20" press mold shell 22⅛" O.D. x 6" wide x 20½" I.D.
Operation: Turning, boring rough forgings.
Material: 40-30 carbon steel.
Tools: Firthite carbide tools.
Feed: .012 at 31 rpm.
Cut: ⅛" to ¼" on O.D. and boring.

Tool life was excellent. Machines stayed clean. High production, with minimum scrap, was the rule year in and year out.

Two years ago the shop was persuaded to try a competitive oil on the above operation. Test results showed that the competitive oil, costing three times as much, lacked stability. Performance was far inferior to that of Sunoco Emulsifying Cutting Oil in regard to tool life and quality of finish. The company was quickly convinced that its original choice had been sound.

In all machine shop operations, on both ferrous and nonferrous metals, you'll find Sunoco Emulsifying Cutting Oil and Sunicut* straight cutting oils of real assistance. They help maintain production schedules, lengthen tool life, and keep operating costs down. For a free Sun cutting oil recommendation card, write Dept. AM-3.

*Sunicut is a trademark of Sun Oil Company

SUN OIL COMPANY · *Philadelphia 3, Pa.*
In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

Taper-Shank Twist Drills . . . II

Size Drill	Regular Shank			Shank Smaller than Regular			Shank Larger than Regular		
	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.
1	3	11	6⅜	....	....	....	4	12	6⅜
1 1/64	3	11 1/16	6 1/2	....	....	....	4	12 1/16	6 1/2
1 1/32	3	11 1/16	6 1/2	....	....	....	4	12 1/16	6 1/2
1 1/64	3	11 1/4	6⅜	....	....	....	4	12 1/4	6⅜
1 1/16	3	11 1/4	6⅜	....	....	....	4	12 1/4	6⅜
1 1/64	4	12 1/2	6⅞	3	11 1/2	6⅞	....	....	....
1 1/32	4	12 1/2	6⅞	3	11 1/2	6⅞	....	....	....
1 3/64	4	12¾	7⅛	3	11¾	7⅛	....	....	....
1 1/16	4	12¾	7⅛	3	11¾	7⅛	....	....	....
1 5/64	4	12⅞	7¼	3	11⅞	7¼	....	....	....
1 3/32	4	12⅞	7¼	3	11⅞	7¼	....	....	....
1 7/64	4	13	7⅜	3	12	7⅜	....	....	....
1 1/16	4	13	7⅜	3	12	7⅜	....	....	....
1 9/64	4	13 1/16	7½	3	12 1/16	7½	....	....	....
1 5/32	4	13⅛	7½	3	12⅛	7½	....	....	....
1 11/64	4	13 1/16	7⅝	3	12 1/16	7⅝	....	....	....
1¼	4	13 1/16	7⅝	3	12 1/16	7⅝	....	....	....
1 13/64	4	14⅛	8½	....	....	....	....	....	....
1 7/32	4	14⅛	8½	....	....	....	....	....	....
1 15/64	4	14¼	8⅝	....	....	....	....	....	....
1 5/16	4	14¼	8⅝	....	....	....	....	....	....
1 21/64	4	14⅜	8¾	....	....	....	....	....	....
1 11/32	4	14⅜	8¾	....	....	....	....	....	....
1 23/64	4	14½	8⅞	....	....	....	....	....	....
1⅜	4	14½	8⅞	....	....	....	....	....	....
1 25/64	4	14⅝	9	....	....	....	....	....	....
1 13/32	4	14⅝	9	....	....	....	....	....	....
1 27/64	4	14¾	9⅛	....	....	....	....	....	....
1⅞	4	14¾	9⅛	....	....	....	....	....	....
1 29/64	4	14⅞	9¼	....	....	....	....	....	....
1 15/32	4	14⅞	9¼	....	....	....	....	....	....
1 31/64	4	15	9⅜	....	....	....	....	....	....
1½	4	15	9⅜	....	....	....	....	....	....
1 33/64	5	16⅜	9⅜	4	15	9⅜	....	....	....
1 17/32	5	16⅜	9⅜	4	15	9⅜	....	....	....
1 35/64	5	16⅝	9⅝	4	15¼	9⅝	....	....	....
1 9/16	5	16⅝	9⅝	4	15¼	9⅝	....	....	....
1 37/64	5	16⅞	9⅞	4	15½	9⅞	....	....	....
1 19/32	5	16⅞	9⅞	4	15½	9⅞	....	....	....
1 39/64	5	17	10	4	15⅝	10	....	....	....
1⅝	5	17	10	4	15⅝	10	....	....	....
1 41/64	5	17 1/16	10⅛	4	15¾	10⅛	....	....	....

Size Drill	Regular Shank			Shank Smaller than Regular			Shank Larger than Regular		
	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.	ASA Taper (Morse)	Over-all Lgth.	Flute Lgth.
1 21/32	5	17⅛	10⅛	4	15¾	10⅛	....	....	....
1 43/64	5	17⅛	10⅛	4	15¾	10⅛	....	....	....
1 11/16	5	17⅛	10⅛	4	15¾	10⅛	....	....	....
1 45/64	5	17⅛	10⅛	4	15¾	10⅛	....	....	....
1 23/32	5	17⅛	10⅛	4	15⅝	10⅛	....	....	....
1 47/64	5	17⅛	10⅛	4	16¼	10⅛	....	....	....
1¾	5	17⅛	10⅛	4	16¼	10⅛	....	....	....
1 25/32	5	17¼	10⅛	4	16¼	10⅛	....	....	....
1 13/16	5	17⅛	10⅛	4	16¼	10⅛	....	....	....
1 27/32	5	17¼	10⅛	4	16¼	10⅛	....	....	....
1⅞	5	17⅜	10⅜	4	16½	10½	....	....	....
1 29/32	5	17⅜	10⅜	4	16½	10½	....	....	....
1 15/16	5	17⅜	10⅜	4	16⅝	10⅝	....	....	....
1 31/32	5	17⅝	10⅜	4	16⅝	10⅝	....	....	....
2	5	17⅜	10⅜	4	16⅝	10⅝	....	....	....
2 1/32	5	17⅝	10⅜	....	....	....	....	....	....
2 1/16	5	17¾	10¼	....	....	....	....	....	....
2 3/32	5	17⅝	10¼	....	....	....	....	....	....
2⅛	5	17¾	10¼	....	....	....	....	....	....
2 5/32	5	17⅝	10¼	....	....	....	....	....	....
2 3/16	5	17⅝	10¼	....	....	....	....	....	....
2 7/32	5	17⅜	10⅜	....	....	....	....	....	....
2¼	5	17⅜	10⅜	....	....	....	....	....	....
2 9/32	5	17⅜	10⅜	....	....	....	....	....	....
2⅜	5	17⅜	10⅜	....	....	....	....	....	....
2 11/32	5	18¾	11¼	....	....	....	....	....	....
2½	5	18¾	11¼	....	....	....	....	....	....
2 9/32	5	19½	11⅞	....	....	....	....	....	....
2⅝	5	19½	11⅞	....	....	....	....	....	....
2 11/32	5	20⅜	12¾	....	....	....	....	....	....
2¾	5	20⅜	12¾	....	....	....	....	....	....
2 13/32	5	21⅛	13⅜	....	....	....	....	....	....
2⅞	5	21⅛	13⅜	....	....	....	....	....	....
2 15/32	5	21¾	14	....	....	....	....	....	....
3	5	21¾	14	....	....	....	....	....	....
3 1/16	6	24½	14⅝	5	22	14¼	....	....	....
3 1/16	6	24½	14⅝	5	22	14¼	....	....	....
3 3/16	6	24½	14⅝	5	22	14¼	....	....	....
3¼	6	25½	15½	5	23	15¼	....	....	....
3 5/16	6	25½	15½	5	23	15¼	....	....	....
3 5/16	6	25½	15½	5	23	15¼	....	....	....
3 7/16	6	25½	15½	5	23	15¼	....	....	....
3½	6	26½	16⅝	5	24	16¼	....	....	....

SEE WHAT

SIMONDS

offers in these famous

"RED END"

Hack Saw Blades

ACCURATELY MILLED TEETH

Simonds Design Tooth Shape, maintained by accurate milling, provides perfectly formed teeth of exact height. This distributes wear evenly to all teeth with resultant longer cutting life.

PRECISION SET TEETH

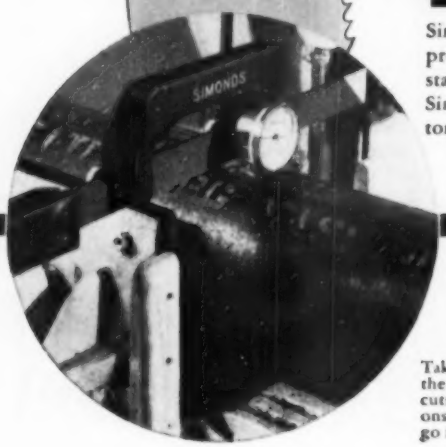
Machines of advanced design set the teeth to exacting tolerances. This not only provides adequate clearance but results in straighter cuts throughout the life of the blade.

UNIFORM HARDNESS

Simonds Method of Heat Treating produces uniform hardness throughout the length of the blade unapproached by conventional heat treating methods. As a result, there is no variation in the grain structure of the steel and the teeth hold a cutting edge longer. This means consistently better cutting performance and low cutting costs.

A "RIGHT" BLADE FOR EVERY NEED

Simonds High Speed, Molybdenum, and Standard Steel Blades provide a "right" blade for every job — hand or power. All standard sizes are available from stock through your local Simonds Distributor. Consult the Classified Telephone Directory under "SAWS" or write the nearest Simonds Branch.



SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Branch Offices in Boston, Chicago, San Francisco and Portland, Ore.
Canadian Factory in Montreal, Que.

Take the guesswork out of hack saw tensioning with a SIMOMETER—the easy, modern way to insure correct blade tension and get straight cuts, faster cuts and more cuts per blade. Ask for a SIMOMETER demonstration and see for yourself how it can make your hack saw dollars go farther.

TALKING SHOP

Uranium Plate

B. F. GOODRICH Research Center has been licensed by the AEC to purchase ¼ lb of uranium metal for experimental use. It will be used to spray mounted samples, particularly of light-weight elements, before study in the electron microscope. Heavy metal atoms, sprayed obliquely in vacuo against a mounted sample, coat one side of it, hence cause unsprayed areas on the opposite side to appear as deep shadows, creating a 3-dimensional effect that aids study.

Water Oiling

AFTER TRYING VAINLY to seal ball bearings in lens-grinding equipment for years, one maker has resorted to a high-pressure distilled-water spray. It "lubricates" the 6000-rpm spindle and washes any abrasive or silica from bearings and lens.

Priority

LEGEND HAS IT that an aged and revered minister of the gospel finally put aside his earthly burden and appeared at the Heavenly gates for his just reward. St. Peter was busy, asked that the minister wait a few minutes. Just then, accompanied by loud bell clangs, a brash young fellow arrived and demanded admittance. The gates swung wide and in he went, while St. Peter obviously did the necessary book work afterward. Feeling displaced and mistreated, the minister said: "Who is that brash youngster who takes precedence over me? I have spent a long and busy lifetime in the service of the Lord." Said St. Peter, with a shrug, "That's Joe Doakes, a crane operator from a boiler shop. He's scared Hell out of more people than all you ministers put together!"

Rental With Option

EMERMAN MACHINERY CORP., Chicago, began last August an unusual 3-year payment plan, and about 30% of recent inquiries and a substantial volume of recent business has been on that basis. In effect, the customer pays 1/36 of the purchase price per month. If he decides to return the machine at any time during that period, no further payment or extra charges are made. If he initially rented the machine, he can decide to purchase, and rental previously paid will be credited against the cost. The only extra charge is 4½% interest on the full selling price during the rental period, cumulative if the machine has been rented for more than a year.

Toys Grow Up

REMEMBER how tin toys were assembled with tabs through slots? Long Mfg. Div., Borg-Warner Corp., is using the same idea in making steel torque converters. C-shaped stamped blades have one tab at the inside, two on the outside. Outer tabs fit depressions in the housing, the inner one enters a radial slot in the torus ring and is simply bent over . . . This converter will be delivered to Studebaker as an assembly containing hydraulic disk clutch (to lock out converter at high speeds), all converter elements, flywheel and starter gear. One half of the housing sockets goes in the top. The seam is then welded by submerged arc, so the only way to separate 'em is by machining off the weld. This eliminates some 50 bolts, gaskets, drilling holes, machining faces, and much assembly labor, but will require factory repairs on interchangeable units.

Heavy Spots

WELDING RESEARCH COUNCIL reports spot welds have been made successfully in heavy-gage steel up to ½ in. thick. It is advisable to temper the weld after cooling by reheating to proper temperature while the material is still between the electrodes. Makes it possible to button up a building . . . Also, in spot welding coated steels, it has been found that number of spots that can be made before electrodes stick to zinc or cadmium plates can be doubled—and sticking reduced in severity—by controlling initial application of current.

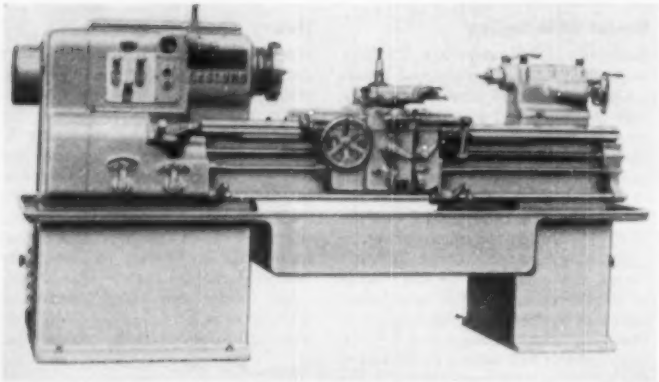
New—But Old

LAST DEC. 10, we published an article on test jigs. From James Pearman in England comes a letter saying that similar gages were common practice at Maxim Gun and at the Enfield Armory in 1900. Just shows we can still learn things long known.

$400,000 Saved

CHICAGO, noted for profligacy, has just tossed out two bids of $7.65 each for new street signs and accepted one for a new design at $1.67 each. As 67,000 signs are involved, there'll be a real saving. The new design, made by a city associate traffic engineer, is strip steel, flanged at top and bottom, and porcelain-enameled in yellow and black. Instead of brackets or bands, the sign will be fastened to stainless steel studs, welded to the pole by the new stud-welding gun.

New Shop Equipment



Power, Spindle Speeds Increased In LeBlond Lathe Line

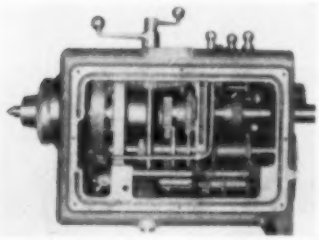
Lathes of 12-, 14-, and 16-in. swing size with 24 spindle speeds, and a 20-in. size with 32 spindle speeds are included in this heavy-duty engine-lathe line. The two smaller units offer 1250 rpm max, and use 7½ hp 1800 rpm motor; the 16-in. unit employs a 10- or 15-hp 1800-rpm motor; and the 20-in. machine, a 15- or 20-hp 1200-rpm motor.

Sixty feed and thread changes are obtained through hardened alloy-steel gears, housed in an enclosed, automatically lubricated quick-change box. Shafts are supported on anti-friction bearings. The LeBlond compensating V-way principle is incorporated in the bed, as well as replaceable hardened-and-ground steel bedways, front and rear. The apron is one-piece construction with positive-jaw feed clutch and single-lever length and feed control. The tailstock is an offset thrust-lock unit.

The headstock utilizes the LeBlond free-running principle; any gears not actually in use in any given speed are cut out of the gear train, decreasing the load on the motor. This leaves more of the main drive motor drive horsepower free for cutting.

The LeBlond line of heavy-duty engine lathes also includes 25-, 32-, 40-, and 50-in. machines, all said to conform to the same basic design.

R. K. LeBlond Machine Tool Co., Cincinnati Ohio



Automatically lubricated quick-change box with alloy-steel gears provides 60 feed and thread changes

Stainless Steel Combines Hardness, Corrosion Resistance

Precipitation - hardening stainless steel, Armco 17-7 PH, is reported to have the strength and hardness of high-carbon spring steels and a corrosion resistance approaching that of 18-8. It is specially recommended for springs, pressure tanks, diaphragms and disks, conveyor parts, spring clips, washers, and similar parts.

Tensile strength ranges from 260,000 to 345,000 psi; yield strength from 250,000 to 340,000 psi; rockwell hardness C50 and up, and proportional limit in torsion 150,000 to 185,000 psi.

Armco Steel Corp., Middletown, Ohio.

Small Snap-Action Switch Immune to Corrosive Atmospheres

Electrical or mechanical operations of the hermetically sealed 1HSI switch are said to be unaffected by corrosive atmospheres, change in atmospheric pressure, or change in temperature. Switches may even be operated under oil and other fluids. The sealed case of the switch is metal and is filled with inert gas under pressure. This case is secured to a plastic mounting base to which are assembled screw terminals, so arranged as to avoid strain on the glass beads which seal the conductor into the metal case. Circuit arrangement is single-pole, double-throw and current capacity at any altitude at 28 dc is 25 amps, resistive, and 10 amps inductive. The unit is 1 15/16 in. long, 11/16 in. wide, and 1 7/64 in. high.

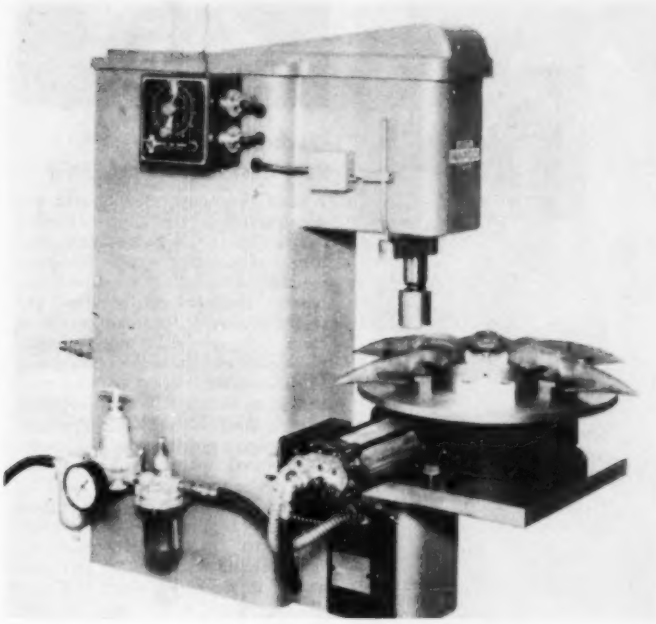
Microswitch, Freeport, Ill.

Air-Turbine Motor Embodies Automatic-Governor Control

The automatic governor of this air-turbine motor maintains a constant speed of 50,000 rpm. Actuated by centrifugal force developed by grinder-spindle rotation, the governor cuts in greater air supply under work load. When the load is removed, air supply is automatically reduced to normal. The motor was designed primarily for the Onsrud DI-C ½-hp air-turbine grinder.

Onsrud Machine Works, Inc., Chicago, Ill.

Materials and Parts



Oil-Hydraulic Press Equipped With 8-Station Index Table

Automatic cycling is built into this oil-hydraulic press in the form of an 8-station air-operated automatic dial index table. A manually operated momentary-contact switch energizes the automatic reset timer, starting both timing and the downstroke of the press ram. When the preset time has elapsed the timer de-energizes the solenoid valve controlling the ram, and the ram begins its return stroke. At the top of the stroke a one-way dog trips a microswitch connected to the advance side of the index-table cylinder causing the table to advance to the next position. When the next position is reached, the cycle begins again automatically. Cycles can be adjusted from one to 60 seconds. The electrical circuit is provided with a master switch which can be operated either by hand or foot. Automatic ejection of parts can be done either mechanically or with exhaust air. The press is made in 2½- and 5-ton models with stroke of 2 or 5 in. Pressure stroke and speed of the ram are all said to be easily and quickly adjustable. Tables can be furnished with 4, 6, 8, 12, or 24 positions, with or without complete tooling.

Hy-Air Products Co., Jackson, Mich.

Reltool Hollow-Mill Line Made of High-Speed Steel

Hollow mills are available with two forms of teeth; undercut teeth for milling steel, and straight teeth for milling brass and other non-ferrous metals. Either type is furnished with three or four teeth as specified. These mills are stocked in hole sizes from 3/32 to 1 in. with shank sizes from ⅝ to 1¾ and over-all lengths from 1½ to 2¼ in.

Reltool Corp., 4540 W. Burnham St., Milwaukee 14, Wis.

...INCLUDING

Automatic production machine rules horizontal, beveled, or cylindrical surfaces at speeds up to 60 lines per min.....page 148

Roll-forming unit takes material up to 5-in. width, 20 gage. It forms, curves, embosses, and cuts in continuous operation.....page 149

Lathe with 11-in. swing and 1⅜-in. spindle hole provides 45- to 1500-rpm spindle range..page 150

Hydraulic forcing press has 150-ton capacity and 275-imp maximum ram speed.....page 152

Welding-machine controls are built into electrode holder. Remote control starts and stops machine, selects polarity, and regulates heat.....page 154

Medium-weight drilling machine incorporates 25-in. swing. Rated capacities: ¾ in. steel, 1 in. cast iron .....page 158

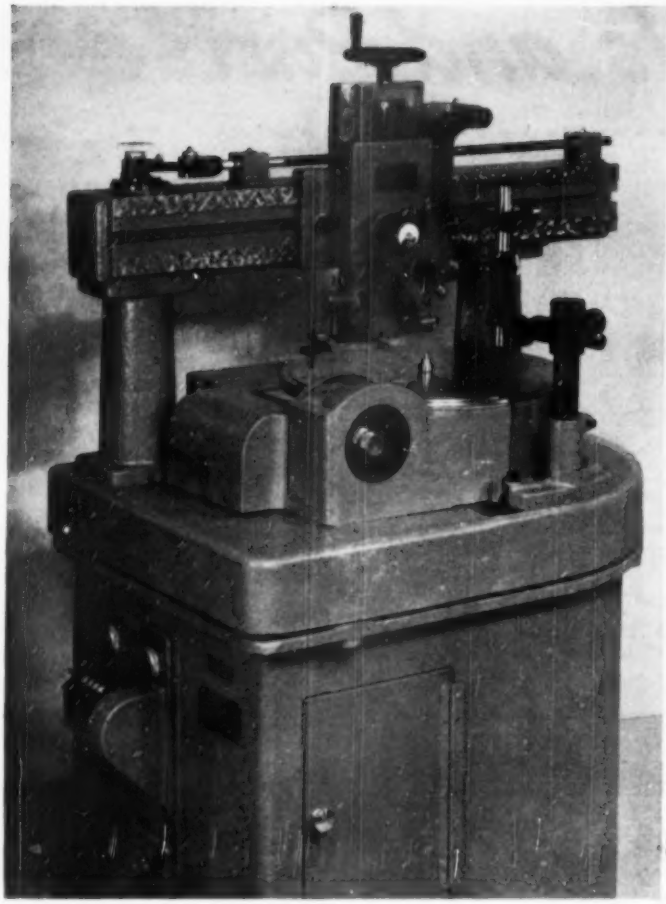
Self-indexing rotary press-brake gage cuts materials handling time in sheet metal bending operations .....page 160

NEW BULLETINS for your Shop Library including 28-page bulletin on high-power hydraulics for high-speed production operations. Riveting, punching, and pressing are among those discussed and illustrated .....page 225-226

...and in April 3

THE SHOW IN PRINT, a preview of new equipment to be displayed at the Tool Engineers' (Cost-Cutting) Industrial Exposition in Philadelphia next month . . . including **Twin-head machine** mills several surfaces simultaneously.

Double rivet setter with 14-in. throat sets 9/64-in. steel tubular rivets up to ⅝-in. length.

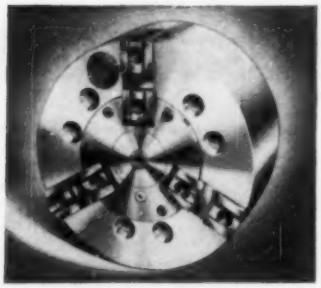


Automatic Production Machine Divides Circular Scales

Lines can be ruled on horizontal, beveled, or cylindrical surfaces of any machinable material at speeds up to 60 lines per min with this fully-automatic machine for production ruling of precision circular scales. The spacings are accurate to ± 15 sec of the arc. Lines ruled are said to be uniform in width and depth and free from ragged edges.

Work to be ruled is held on an indexing worktable which is rotated past a stationary ruling mechanism by a worm. After setting the spacing mechanism the operator centers and clamps the work in position and actuates the starting handle. At points predetermined by setting of spacing mechanism the worktable stops momentarily while the ruling mechanism rules a line of the specified length, width, and depth. When the last line of the scale has been ruled the machine stops and the operator substitutes a new piece for the finished one and starts the machine again. The main driveshaft is powered from a 1-hp electric motor. The worktable is driven by a closely fitted worm, rotation of which is governed by ratchet and pawl mechanism. Two interchangeable ratchet wheels with 100 and 120 teeth respectively are supplied as standard equipment and permit spacing of practically all normally required graduations including verniers. Enclosed working parts of spacing mechanism are easily accessible.

The Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill.



Chuck Body Made of Heat-Treated Aluminum Alloy

Whiton power-operated chucks are constructed of Whitaloy, a special-analysis heat-treated aluminum alloy. While eliminating excessive chuck weight this material is reported to possess the strength of steel and wearing quality found in cast iron. Built with only four moving parts, the wedge and three jaws, the chuck is said to possess great gripping power and to maintain built-in accuracy over a long period. Jaws, wedge, and wedge bushing are of alloy steel, heat-treated, machined, and ground. The power most commonly used for developing gripping pressure of these chucks is supplied by air cylinders. The units are especially adaptable to turret and engine lathes and other automatic machines where long runs of repetitive operations are performed.

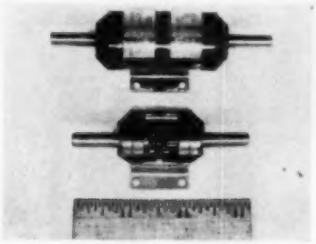
The Whiton Machine Co., New London, Conn.

Automatic Coil Cradle Equipped With Mercury-Switch Control

Material up to 6-in. width and coils up to 40-in. OD and 1000 lb can be handled in the Model ACCI-640 coil cradle. The cradle is equipped with hardened-and-ground feed rolls, mercury-switch control, and motor for operation on 220-440 v, 3 phase, 60 ac. The mercury-switch control pro-

vides a loose loop of material between the cradle and the fabrication machine, reducing strain on the operator or on the feed unit of the machine. To load, a wooden core is first inserted in the ID of the coil. The coil support rod (standard equipment) is then inserted in the hole in the wooden core. The coil is next rolled into position in the cradle by a handwheel actuating the elevating screws.

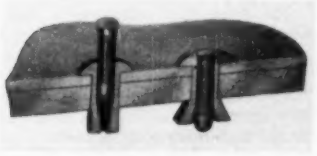
U. S. Tool Co. Inc., Ampere, East Orange, N. J.



Miniature Speed Changers Have 96-Dp Precision Gears

Precision-hobbed gears of 96 dp are available in the Metron line of miniature speed changers. These hardened gears are said to provide smoother, quieter operation, better angular precision, and about one-half the backlash obtained with the 48-dp extra gears in the standard units. Available in single or multiple sections and with more than 500 different ratios, these units are for application where low-power quality gearing is required. Speed as high as 20,000 rpm on the high-speed shaft and torque up to 1½ in. lb on the low-speed shaft are practical.

Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.



Rivets Driven by Hammer

The Drive Pin rivet consists of two parts; a hollow rivet member with a hole, tapered at the bottom, and a serrated drive pin. The rivet is locked in position by striking the pin with an ordinary hammer. The resulting joint is said to be tight and have high resistance to loosening.

The Cherry Rivet Co., 239 Winston St., Los Angeles, Calif.

Roll-Forming Machines Form, Curve, Emboss, and Cut

Built in standard sizes to take 20-gage material up to 5 in. wide, the Type H roll-forming machines form, curve, emboss, and cut in one continuous operation. Special sizes for material up to 50 in. wide by ¾ in. thick may be obtained. The units are of all-steel construction including base and housing and may be built with any number of spindles and handle material of any desired widths. Speeds vary from 50 to 300 fpm. Top spindles may be raised or lowered by means of two adjusting screws for each spindle. Precision ball bearings with alemite lubrication fittings are employed throughout the machine. Roll spindles are chrome-nickel steel, hardened and ground.

American Roller Die Corp., Cleveland 17, Ohio

Oil-Tight Control Station For Machine Tool Installations

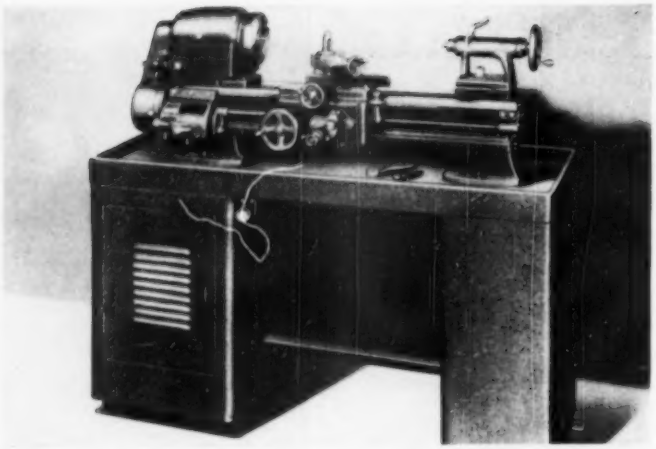
Control stations and units are specially designed for machine-tool control and other heavy-duty installations and can be used in any desired combination in the stations. A resilient gasket protects the station against oil, coolant, cutting compounds, and water. Units and nameplates can be rotated, 90, 180, or 270° for mounting in any position. Terminals on the contact block are reversible for front and rear condition. Operating heads and contact blocks are both interchangeable. For mounting units in machine cavities or in banks in large control stations, contact blocks can be cover mounted.

Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

Compactability Increased in Stainless-Steel Powders

The strength of the pressed compacts of this stainless-steel powder, prior to sintering, is claimed to have been boosted to 15 times that of other stainless-steel powders. Chemical analysis of the power corresponds to that of standard chrome and chrome-nickel steels and parts prepared by pressing and sintering the powders are reported to exhibit the high chemical strength and corrosion resistance characteristic of these compositions.

The American Electro Metal Corp., 320 Yonkers Ave., Yonkers 2, N. Y.

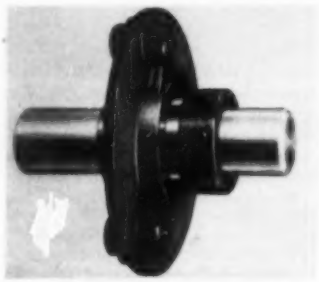


Logan 11-In. Lathe Provides 45- to 1500-Rpm Spindle Range

With 1-in. collet capacity, 11-in. swing, and 1⅝-in. spindle hole, these lathes are built in two models, No. 955 with 24-in. center distance, and No. 957 with 36-in. center distance. Ball-bearing-mounted spindles permit speeds of 45 to 1500 rpm without bearing adjustment.

Bedways are precision ground to within 0.0005-in. lineal accuracy and less than 0.0005-in. total runout of the spindle, measured 12 in. from the front bearing. The steel pedestal base is of recessed construction at floor level, permitting toe room for the operator and simplifying cleaning. No. 955 is priced at $585.00 and No. 957 at $635.00, both fob Chicago.

Logan Engineering Co., 4901 West Lawrence Ave., Chicago 30, Ill.



Light-Duty Anti-Friction Bearing Made of Pressed-Steel Stampings

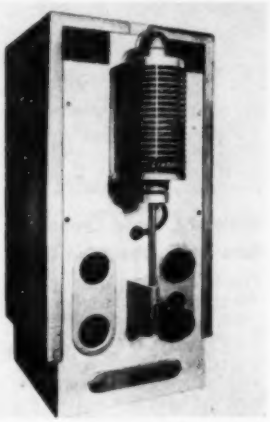
Designed primarily for light-duty, slow-speed anti-friction bearing application the Flangette is a simple arrangement of two pressed-steel stampings which form a flanged housing inclosing a standard Fafnir self-aligning Wide Inner Ring ball-bearing. The light-weight unit has factory sealed-in lubrication. It is available in shafts of 18 sizes ranging from ½ to 2 3/16 in.

The Fafnir Bearing Co., New Britain, Conn.

Solenoid-Operated Oiler Lubricates Conveyor Chains

Automatic chain oiler assures positive lubrication whenever the chain is running and eliminates need for applying lubricant by hand. Lubricant is fed by gravity from a reservoir through a solenoid-operated valve and a sight-feed valve, to a brush which rides on the chain. The solenoid valve can be wired across the line of the driving motor, thus turning on the oiler only when the chain runs. Drop feeding of the lubricant through sight-feed valves to brushes can be adjusted, and adjustments retained by use of a friction lock. Dual-brush units are available with center distance of 3½ in. between brushes. Wider distances can be provided. Brushes are 2 in. in dia. Reservoirs are available in six sizes ranging from 9 oz to one gal. and are made of lucite or glass for operation at above 160 F.

Oil-Rite Corp., Milwaukee 15, Wis.



Induction Heating Unit Analyzes Iron, Steel for Carbon, Sulphur

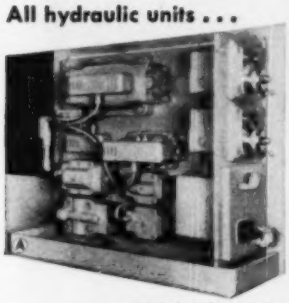
High-frequency induction heater is for carbon and surphur analysis of iron and steel by direct combustion at temperatures in excess of 3000 F. The sample is melted in a matter of two or three seconds by inductive heating. Adjacent parts are heated only by radiation or combustion from the relatively small charge.

The apparatus comprises a short vertical glass combustion tube surrounded by an air-cooled coil to which radio frequency energy is supplied by a vacuum-tube oscillator. The conventional boat is replaced by a high-refractory "cupelet" developed to withstand the thermal shock produced during the combustion cycle. Oxygen is introduced through integral piping in such manner that rubber tubing has been eliminated and flow is regulated by control valves on the front panel. The unit is 28½ in. high, 13½ in. wide, 17 in. deep, and operates on 115 v, 60, single-phase.

Laboratory Equipment Div., Lindberg Engineering Co., 2444 W. Hubbard St., Chicago 12, Ill.

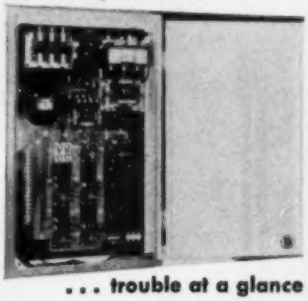
MACHINE TOOL SCOOP!

All hydraulic units . . .

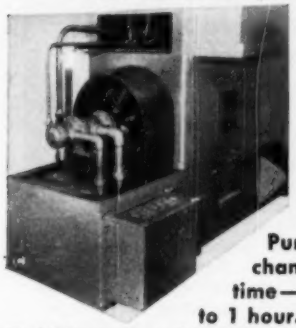


. . . out in the open

Locate any electrical . . .

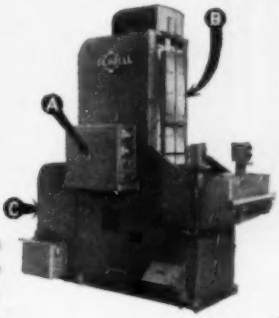


. . . trouble at a glance



Pump change time—½ to 1 hour. . .

Quickly replaceable Filter Units



Colonial Broaching Machines BEAT J.I.C. Standards!

Colonial broaching machines—SINGLE and DUAL RAM for surface broaching, PULL-DOWN and PULL-UP for internal broaching—not only meet J.I.C. standards but actually GO ONE STEP FURTHER.

Colonial has added interchangeability of components—*hydraulic, mechanical and electrical.*

The combination of these two steps ahead in broaching machines—J.I.C. standards and standardization and interchangeability of components—also means that STANDARD Colonial machines can be adapted with amazing ease to all kinds of AUTOMATION:

- **. . . automatic loading and unloading**
- **. . . hopper and magazine feeds**
- **. . . automatic indexing and clamping**
- **. . . mechanical and electrical interlock with other machines (for automatic transfer of work between machines)**

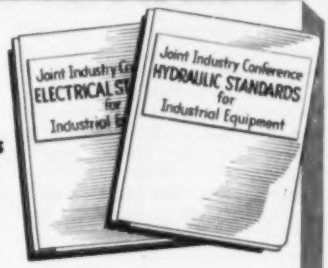
We will be glad to send you descriptive bulletins on these machines.

PIONEERS OF H.S.S. BROACHING

COLONIAL

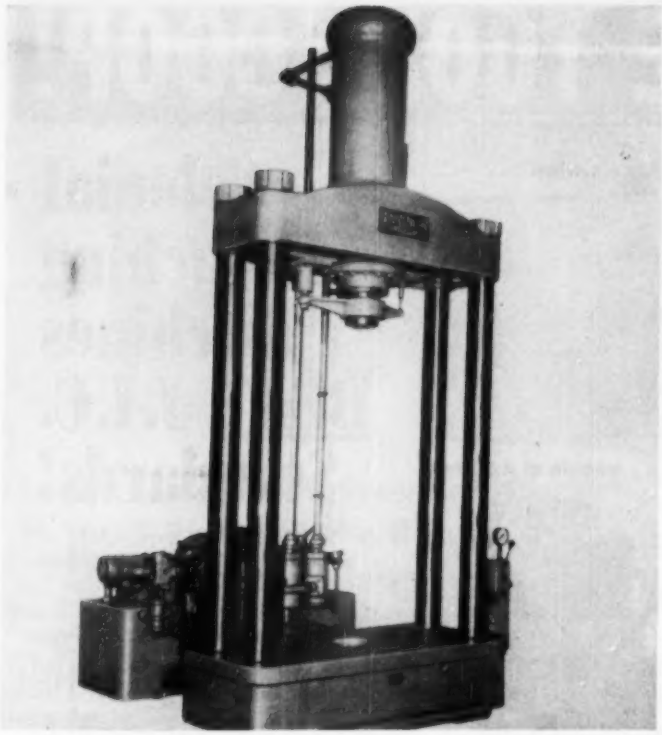
BROACH CO. DETROIT 13

J.I.C. Standards were set up as a goal



. . . by the Joint Industry Conference of major users and manufacturers of machine tools and accessory equipment. Covering hydraulic and electric operation, they set forth what is IDEAL machine design to insure absolute MINIMUM DOWN-TIME, and MAXIMUM ACCESSIBILITY and SERVICEABILITY of operating units, plus MAXIMUM OPERATOR SAFETY.

When buying ANY kind of machine tool, it will pay you to check how close its design comes to meeting these standards.



150-Ton Forcing Press Provides 275-Ipm Ram Speed

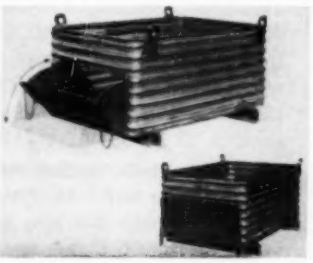
Hydraulic forcing press is used primarily for press-fit assembly of shafts to armatures and rotors. This 150-ton, 4-post unit offers a maximum of 275-ipm ram speed, has an 82-in. gap, ram up, and a 48 in. maximum stroke. There are 60 in. between columns, left to right, and 10 in. front to back. The table is 36 in. front to back, 18 in. above the floor, and has a 10-in. hole in the center to allow shafts to extend through the table. The unit incorporates a sensitive pressure control operated by a single hand lever. A stop provides for applying uniform pressure repetitively. Pressures can vary from 15 to 150 tons.

Hannifin Corp., 1118 S. Kilbourn Ave., Chicago 24, Ill.

Adjustable-Speed Motor Drive Built to Special Requirements

Available in ¾- to 2-hp sizes the Reliance V°S drive is being built expressly to meet the specialized requirements of original equipment manufacturers. They are all-electric variable-voltage units, operating on ac circuits. Speeds range from 290 to 2300 rpm at rated output and as low as 80 rpm for short periods or at light loads. Drive provides stepless speed selection and adjustment through the operating range.

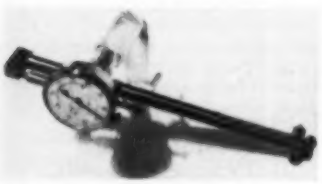
Reliance Electric and Engineering Co., 1111 Ivanhoe Road, Cleveland 10, Ohio.



Corrugated-Steel Stacking Box Equipped With Hinged Door

The chain-operated hinged door on this stacking box can be opened to any set angle, simplifying parts disposal. Boxes are built to dimensions and load capacities specified by the customer, including underneath clearance. Crane lugs, stacking brackets, and color of paint desired may also be specified.

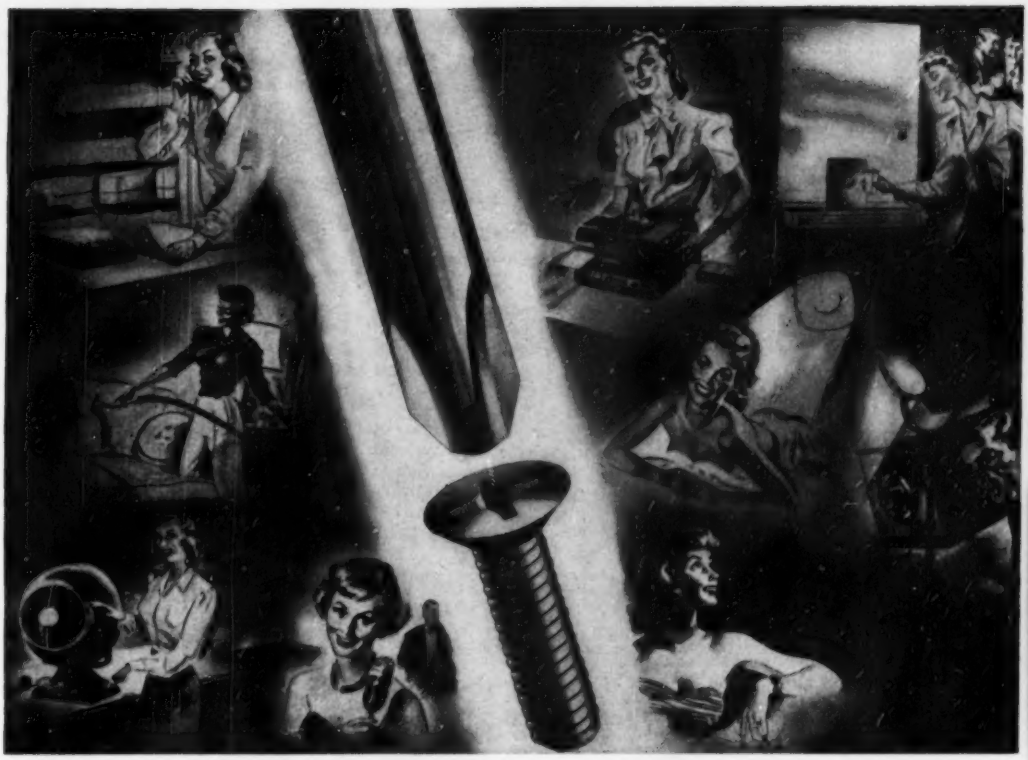
Palmer-Shile Co., Detroit, Mich.



Dial Bore Gage Requires Minimum Operator Skill

Diameters of internal grooves for O-rings, snap rings, oil rings, and straight bores are measured with minimum skill required by this dial bore gage. The instrument locates on the diameter of the cut to be measured and its indicator dial immediately gives the desired dimension. Deep holes are measured as readily as shallow ones, and standard instruments can accommodate all dia from ½ to 6 in. Special models are produced to meet unusual customer requirements. Standard tip sizes are 1/16- and ⅛-in. OD. However, special tips are available for measuring snap-ring grooves as small as 0.03 in. in width.

Rimat Machine Tool Co., 1117 Air Way, Glendale 1, Calif.



Top Products in Every Line
Cut Costs and Build Sales
with AMERICAN PHILLIPS SCREWS

HOW THEY CUT COSTS: From vacuum cleaners to vending machines; from trucks to office appliances and suntan lamps . . . manufacturers use American Phillips Screws to speed up production, stop spoilage, and cut unit-costs. For these modern fastenings banish fumbling, crooked driving and scarred surfaces . . . *cut assembly time as much as 50%.*

HOW THEY BUILD SALES: On any product, the crossed-recess of American Phillips Screws is a "green light" to buyers who stop and look for an outward index of inward quality. They know that smooth-headed American Phillips Screws protect product-performance by staying tight and resisting vibration. Does *your* product have these two American Phillips advantages of cost-reduction and sales-promotion? No reason why it shouldn't . . . *for American Phillips Screws always cost least to use.* Write for proof.

AMERICAN SCREW COMPANY, Main Office: Providence 1, R. I.
Plants at Willimantic, Conn., and Norristown, Pa.
Warehouses at: Chicago 11: 589 E. Illinois St. Detroit 2: 502 Stephenson Bldg.

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Shop Measuring Microscope Employs Non-Rotating Spindle

All functions of linear coordinate and angular measurement can be performed on the Boeckeler Model 1, measuring microscope. Range of measurement is 6½ in. and work can be surveyed in coordinates up to 6½x6½ in. A non-rotating spindle is used on the micrometer head. Lead-screw pitch is 20 tpi and graduations around thimble are in 50 thousandths. Over-all magnification is about 32X. Bi-filar crosshairs and special or standard reticles can be furnished. The price is $415.

Boeckeler Instrument Co., 51 E. Rillito St., Tucson, Arizona

Metal-Cutoff Bandsaw Handles 6x12-in. Rectangular Stock

Model 612 metal bandsaw employs a ⅝- x 0.032-in. blade and is capable of 15-, 100-, 175-, and 300-fpm cutting speeds. It handles capacities up to 6-in. round and 6x12-in. rectangular stock, accommodating all shapes of metals. Cooling-system attachment can be installed in a matter of minutes. The unit is built of semi-steel castings and alloy steel and has cast-aluminum safety guards. Microset stock stop provides quick setting and precision sawing. All controls are within a 7-in. radius.

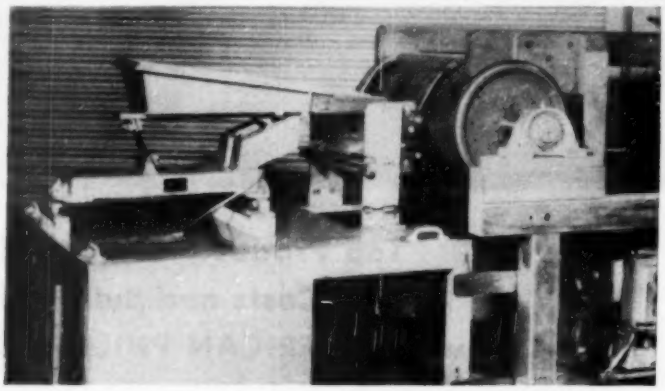
Famco Machine Co., Racine, Wis.

Welding-Machine Controls Built Into Electrode Holder

Consisting of two parts, a control box, housed in stainless steel and mounted on the welding machine, and a standard holder equipped with a special grip, this device transfers all of the machine controls to the electrode holder. The special remote control starts and stops the welding machine, selects polarity, and regulates the heat. Connection is made between the holder controls and the control box by three No. 20 wires rope-spiralled in a cable along with the work cable. The cable is said to sell for about the same price as regular cable, and can be installed in an hour or less.

Two control knobs, concentric with the cable, are located at the back of the holder grip. One is for starting and stopping the machine with either straight or reversed polarity, and the other adjusts the heat with stepless control. For straight-polarity downhand welding the controls cover almost the entire heat range with one setting of the machine from maximum down. For reverse polarity requirements the machine is set for the largest desired electrode size, with the machine voltage control full on. Control will then cover the rod size selected, and the next two smaller rod sizes. At present, equipment is available for Lincoln 200-, 300-, and 400-amp machines, and Hobart machines.

Foster Transformer Co., Cincinnati, Ohio.

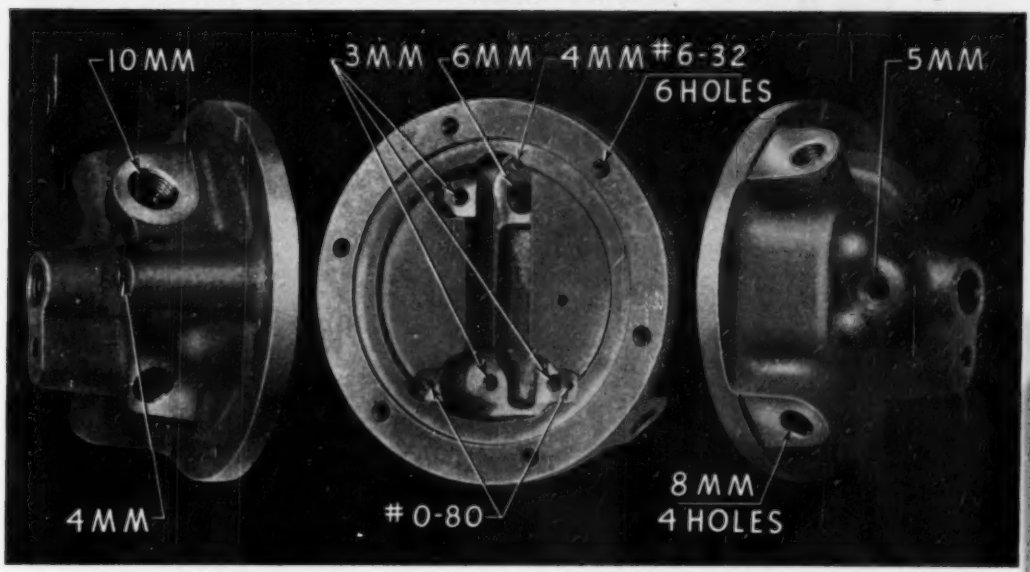


Agitator Separates Magnetic From Non-Magnetic Materials

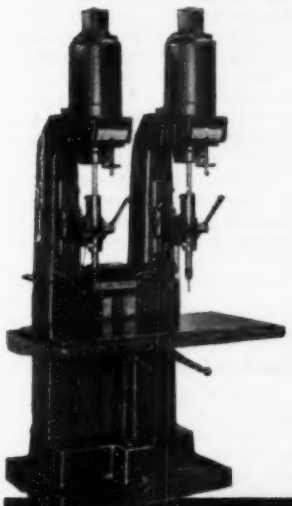
Non-electric separator is designed to separate small amounts of non-magnetic material from large amounts of magnetic material. The unit consists of a permanent magnetic pulley, the surface of which is composed of alternate lengthwise slats of Alnico and of non-magnetic material. A vibrator-tray receiver chute distributes material to be separated to a non-magnetic vane assembly from which it passes to the pulley belt. The receiving chute is slightly tilted downward and attached at the forward end to the agitator feeder. Two induction arms reach over the pulley and react to the north and south magnetic poles which cause a flutter in the vane assembly. As the material reaches the magnetic field of the pulley, the magnetic particles "walk" through the feeder into the surface of the pulley belt, attracted by the alternating assembly. The magnetic particles jump to the belt and adhere to it, until carried out of the magnetic field at which point they drop into a receptacle. About 90% of the magnetic material is withdrawn from the total material to be separated as it reaches the first vane on the feeder. The remaining 10% drops through the feeder with the non-magnetic material, but again passes the lower face of the pulley at which point virtually complete separation is affected.

Eriez Mfg. Co., State St., Erie, Pa.

Can you top this for tapping?



All these gas tight, fine thread holes tapped as routine production



by AMERICAN GAS ACCUMULATOR COMPANY
on a LELAND-GIFFORD
No. 2-LMS Reversing Motor DRILLING MACHINE

Lighthouses, airway beacons, airport lights . . . to assure unfailing operation of these vital units, American Gas Accumulator Company of Elizabeth, New Jersey, builds them with instrument precision. Shown here is only one of many critical parts tapped by AGA on a standard Leland-Gifford No. 2-LMS Drilling Machine with reversing motor control for tapping.

Note the range of sizes — all the way from *#0-80* (pitch dia. 0.0519″) to *10 mm.* (pitch dia. 0.3554″) — in tough Navy Bronze with all tapped holes gas tight. The same machine, incidentally, is used to tap full depth ¾″-14 Whitworth pipe threads (1.063″ OD). Between tapping jobs — with a flick of a switch and a quick tool change — it does double duty as a drilling machine — accurate, sensitive and with a wide range of spindle speeds.

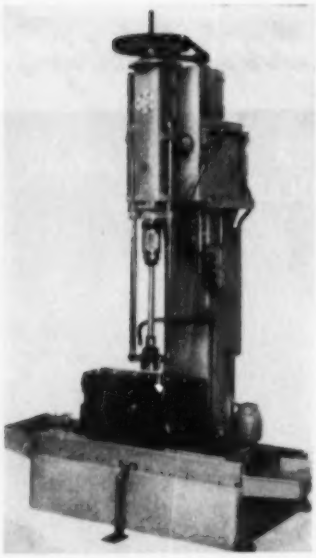
Think what a production drilling machine like this could do for you in your shop or toolroom . . . tough jobs made easy, time saved, costly operations made profitable. Look into it today. Write for complete information.

PRODUCTION MEN
Get This Handy Slide Rule

A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office.

LELAND-GIFFORD
Drilling Machines
WORCESTER 1, MASSACHUSETTS, U.S.A.

CHICAGO 6, 565 W. Washington Blvd.; DETROIT 26, 1533 Dime Bank Bldg.; CLEVELAND 1, P. O. Box 5547; NEWARK 2, Industrial Office Bldg.; ROCHESTER 4 Commerce Bldg.; LOS ANGELES 14, 724 So. Spring St.



Semi-Production Honing Machine Has Single-Lever Head Control

Heavy-duty honing machines, said to have all the performance features of a production machine, hone any bore from 1- to 4-in. dia and up to 10 in in length. All controls of the movement of the hydraulically reciprocated head are on a Uni-Control lever. The tool is inched into the bore, the rotation is started and stopped, the reciprocation speed is regulated, and the tool is withdrawn by manipulation of just one lever. The tool is expanded by an adjusting sleeve on the head and stock removal and size can be computed and controlled by a calibrated ratchet ring on the sleeve.

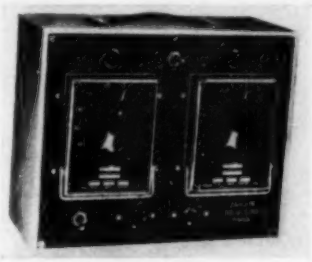
With a lateral indexing table mounted on the base, any type of cylinder block can be reconditioned to factory tolerances. It is not necessary to remove crankshaft bearings or studs. The block is located by pins and held down by quick-lock clamps, and the table is positioned for each cylinder by an indexing bar. Some five to eight blocks can be reconditioned per hr. Production is from 60 to 90 rods per hr with from 0.004 in. to 0.010 in. stock removal.

Micromatic Hone Corp., Detroit, Mich.

Dial-Indicator Point Selector Offers 14 Gaging-Job Contacts

The selection offered by the Starrett Dial-Indicator point selector includes 14 standard and special points, all of which have 4-48 mounting thread to fit any standard American Gage Design indicator. Each point is identified by size or number stamped on the lightweight aluminum ring to which the contacts are secured. Choice includes four standard 13/64-in. points, ¼, ½, ¾, and 1 in. long; nine special shapes for measuring in holes or restricted areas or for gaging on small, resilient or rough surfaces; and a shock-absorbing point with an internal spring and telescoping anvil which protect the indicator from sudden shock blows. Price of complete unit is $11.50.

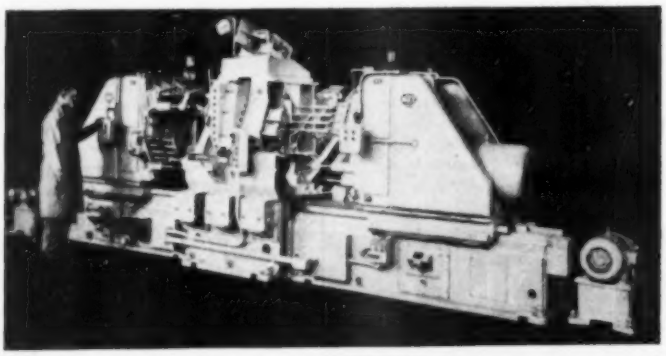
The L. S. Starrett Co., Athol, Mass.



Tandem Recycling Timer Controls Successive Operations

Simple automatic timing device enables the time cycles of two successive production operations to be accurately controlled for infinite periods without need for further adjustment, subsequent to initial setting. When the first operation is completed, the first timing element terminates it and simultaneously actuates the second timing element. When this operation is completed the second timing element both stops the operation and hands the control back to the first. The complete control cabinet measures 11½ x 9 x 7 in. and contains two sockets into which the timing elements are plugged so that they control a single-pole double-throw load relay. The contact circuit of this relay is unpowered, permitting use of the voltage and current necessary for the particular application.

Industrial Timer Corp., Newark, N. J.



AUTOMATIC HOPPER-FEED MULTI-DRILLER drills, chamfers, and rough and finish reams 575 automotive piston pins per hr. Parts are automatically loaded and processed, four at a time. A conveyor, attached to the rear of the fixture, carries away chips—*National Automatic Tool Co., Richmond, Indiana*

Chromate Finish Gives Corrosion Resistance to Aluminum

Iridite Alcote, a chromate corrosion-resistant finish for aluminum, is applied by non-electrolytic dip with the solution operating at room temperature. No fumes are given off during the process. Coatings range in color from clear to light bronze. For greatest color intensity and optimum corrosion resistance, immersion time of two minutes is recommended. Salt-spray tests are reported to indicate resistance to corrosion for as long as 1000 hr on wrought stock and 250 hr for castings.

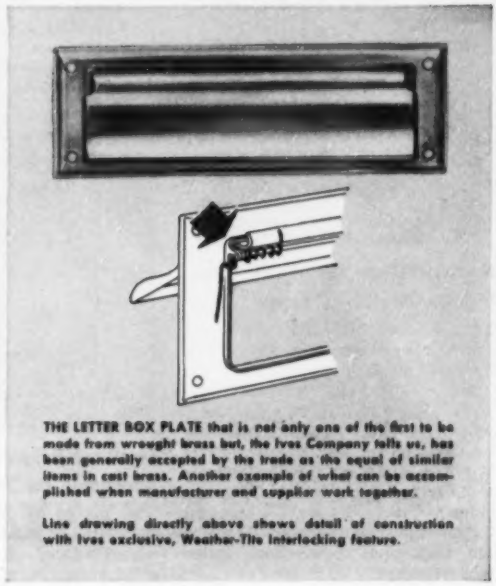
Allied Research Products Inc., Baltimore, Md.

2 MORE EXAMPLES

how manufacturers improved their products . . .
cut production costs with the aid of

REVERE PRODUCTS and SERVICE

UPPER LEFT shows brass shell of the Rev-O-Lite as it comes from the bulging die. Without any extra finishing, which would have been necessary had shell been made of strip and brazed, shell is chrome plated as shown at lower left. At right is the completed assembly of the Rev-O-Lite ready for action on the roofs of all kinds of emergency vehicles such as police patrol cars, ambulances, fire trucks, etc. Chrome finish base is of cast zinc alloy.



THE LETTER BOX PLATE that is not only one of the first to be made from wrought brass but, the Ives Company tells us, has been generally accepted by the trade as the equal of similar items in cast brass. Another example of what can be accomplished when manufacturer and supplier work together.

Line drawing directly above shows detail of construction with Ives exclusive, Weather-Tite interlocking feature.

1. In the development of their Rev-O-Lite, a revolving warning light for emergency vehicles, the Balford Corporation, Jacksonville, Florida, found themselves faced with a production problem regarding the cylindrical shell which contains the lights. The question was; what would be the most efficient and economical way to produce this shell that measures 6″ in length and is 4½″ in diameter at the ends? Should it be formed from a metal strip and brazed? Could tube be used and bulged in a die? Or, should some other method be employed.

Revere, working with the design engineers of the Balford Corporation, exchanged ideas, weighed the pros and cons of various methods; experimented. They found that by using 70/30 Revere Brass Tube in a light anneal temper, it would take the bulging in the die satisfactorily and at the same time show up well as far as grain size control was concerned. By this method, complicated and costly forming operations and brazing could be eliminated; production speeded and the shell formed without any unsightly seam. Also, no extra hand finishing would be necessary before plating.

2. How can you make a letter box plate out of wrought brass and at the same time have it look like cast brass? This problem of the H. B. Ives Company, New Haven, Conn., came up while the Ives engineers were designing a new type plate employing a new method of interlocking the flap and the frame of the box to insure its being weather-tight.

Casting was ruled out as too costly and impractical to construct. If brass strip was used it had to be heavy enough to simulate cast hardware, yet sufficiently flexible to complete a U bend on a 7″ length without fracture or distortion. Also, because the finished plate would in most cases call for a natural brass finish, the stock had to be the right color.

After several consultations with Revere Technical Advisory Service and experiments in their own shop, it was suggested that Revere sheet brass of .062″ thickness and of a certain temper be used. That was it! The combination of proper design and heavy gauge metal resulted in a neat but rugged appearance. The wrought construction made it possible to produce a Weather-Tite plate with exclusive interlocking feature without costly machining operations. In addition, finishing costs were reduced to a minimum.

Perhaps one of the many types of Revere Brass or one of the other Revere Metals or Alloys can help you improve *your* product—cut your production costs. Why not tell Revere's Technical Advisory Service about *your* metal problems? Call the Revere Sales Office nearest you today.

REVERE

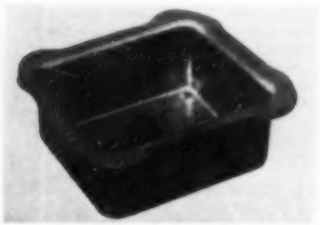
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
230 Park Avenue, New York 17, New York
Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

Medium-Weight Drilling Machine Incorporates 25-In. Swing

The Model E-25, 765-lb drilling machine, was developed to fill the gap between the larger models and the light bench class. It provides 25-in. swing, a variable-speed drive from which the exact spindle speed may be obtained for any size drill from ⅛ to 1 in., and a rectangular 18x26-in. table with coolant trough. The machine is powered by a 1½-hp axial air-gap motor and is said to be suited for high-speed production. Rated capacities are ¾ in. in steel and 1 in. in cast iron. A tachometer on the front of the machine provides speed readings. Five options of spindle speeds, each with a 4 to 1 ratio, are available, ranging from a low of 206 to 825 rpm to a high of 540 to 2160 rpm. Full-floating ball-bearing spindle has 8-in. maximum travel.

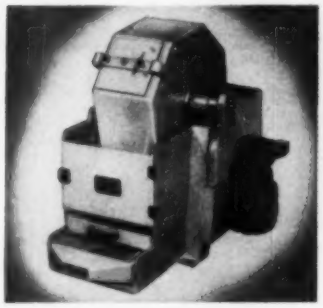
Sibley Machine and Foundry Corp., South Bend, Ind.



Drawing Compound Does Not Separate Under Intense Stress

Fluid Film drawing compound is said to maintain its inherent physical properties during repeated forcible stamping of ferrous and non-ferrous alloys. It is a semi-plastic composition with high film strength and it is reported not to separate under intense stresses. The complex organic molecules of the compound resist chemical and physical deterioration. Neutral in pH, it leaves no heavy residue nor stain on the surface of any alloy. It can be applied by brush, spray, roll, or dip, and can be removed with an alkaline cleaner. It is made in non-pigment form, but is said to handle the toughest draw and applies over mill-oil surface, making precleaning unnecessary.

Northwest Chemical Co., 9310 Roselawn Ave., Detroit 4, Mich.



Small-Lot Deburring Barrels Adjustable for Test Runs

The barrel for this small-lot tumbling unit is rotated by an enclosed variable-speed drive which permits adjustment to any rotating speed between 13 and 39 rpm. In addition to production tumbling of small lots of stampings, die-castings, and similar pieces, this machine is said to be ideal for test runs to determine correct rotating speeds, kind and size of media or abrasive, and best load size. Two sliding trays, the tops of which are perforated, afford quick convenient separation of work from the media. Barrels are available in 0.4 and 2.0 cu ft capacities.

Onsrud Machine Works, Inc., Chicago 51, Ill.

Sizes Marked on Handle of P-K Engineered Hex Key

The key size and corresponding socket-set and cap-screw sizes it will fit are marked on the side of the handle of these P-K engineered hex keys. Keys are made of a special-analysis alloy steel and are engineered to provide the proper leverage according to size. Ends are chamfered for easy insertion, and close tolerances are said to assure proper fit in sockets. Sixteen sizes of P-K Size-marked Hex Keys can be furnished with hex diameters ranging from 0.050 to 1 in.

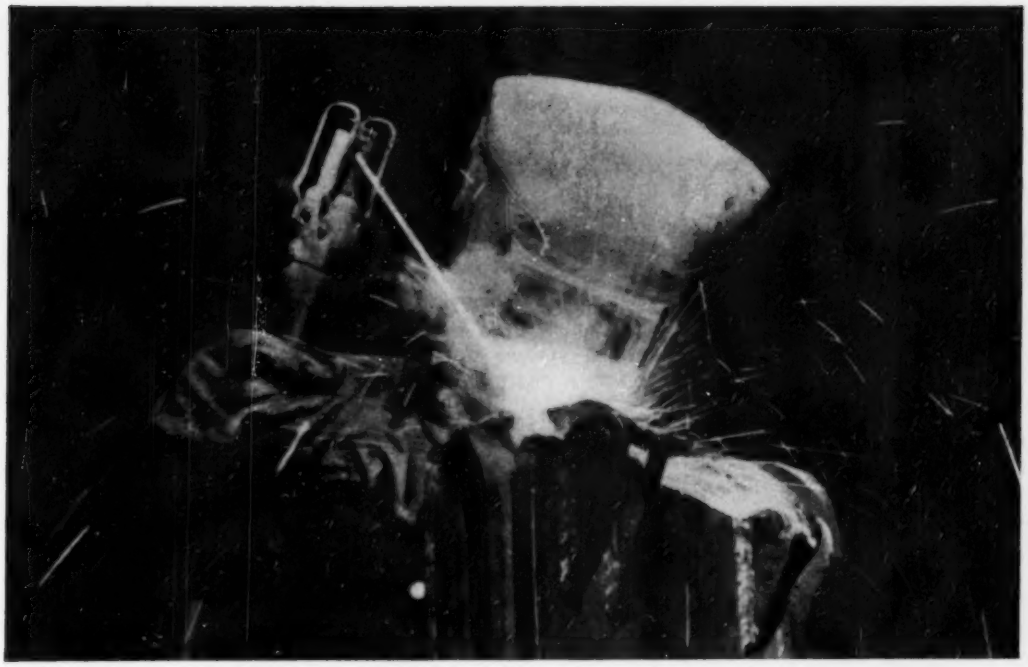
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

Marking Device Roll-Stamps Metal Parts During Machining

The Automarx marking device roll-stamps part numbers or trade marks on metal parts as they are processed in multiple-spindle screw machines. Designed for mounting between positions on the machine, the Automarx leaves all stations free for processing. An adjustable head permits quick setting for round stock up to ¼-in. dia and larger. A removable roll-stamp facilitates quick changing for different parts, and permits regulating the depth of imprint. Marking is done as the machine indexes.

The Special Screw Products Co., 5445 Dunham Rd., Bedford, Ohio

HORIZONTAL DRILLING MACHINE with two Zagar gearless drillheads and two Zagar hydraulic drill feeders, drills and countersinks holes on both sides of ⅜-in. sq steel inserts for an overriding clutch assembly. In the first station of a manually indexed jig 20 holes are drilled, and in the second station the holes are countersunk. The machine is entirely automatic and has a potential production of 3600 complete holes per hr.—*Zagar Tool Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio*



HEARD THE LATEST ABOUT "FLEETWELD 5"?

The world's favorite electrode is back in the limelight again!

Have you used "Fleetweld 5" lately? . . . or talked to any of the thousands of welders who are using this 21-year-old world's leading electrode?

Do so and you'll discover:

This star performer is still tops for *bead shape, lack of slag interference* and *penetration* . . . the qualities that have made it the leader for these many years in class E-6010 welding.

But the stellar attraction today is a *plus value* . . . its

New smoothness of operation

"Fleetweld 5" now has a smoother, *more unidirectional arc.* For every inch of rod, the *arc is confined,* directed right into the joint. *Burn-off is uniform* at all times. The arc is *easier to handle* at all currents and in all positions. Hence, it is easier to get *smooth, uniform beads* . . . every inch of the way. This uniformity gives improved weld metal too!

These new advantages for the veteran of the shielded arc process have been made possible by Lincoln's development of a new "uniformity control" in manufacturing.

Users everywhere are enthusiastic about *every inch, every rod, every shipment* of "Fleetweld 5". Try it and see how it gives *you* the answer to every problem in E-6010 welding!

GET THE FACTS

Send for free Lincoln Welding for Mild Steel. Write
THE LINCOLN ELECTRIC COMPANY
Dept. 103, Cleveland 1, Ohio

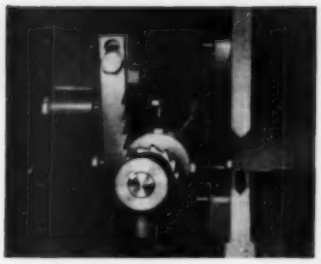
LINCOLN

Sales Offices and Field Service Shops in All Principal Cities

Automatic Hopper Feeds Flat Circular Work

Model H-100 automatic hopper feed is self-contained and incorporates a selector ring, driven by a fractional hp motor. The ring rotates through the work both selecting and feeding it from the under side in one operation. The unit is especially adapted to feeding flat cylindrical work such as washers, nuts, bearing races, and special stampings and finds use in many second operation machines.

Feedall Machine and Engineering Co., 29 Elm Street, Willoughby, Ohio.



Automatic Press-Brake Gage Cuts Material-Handling Time

Self-indexing rotary Rodex gage makes possible as many as four different bends in a piece of metal before it leaves the operator's hands. The gage consists of a rack-and-gear assembly which automatically rotates adjustable gage stops into position and holds them securely until bend has been made. The rack, attached directly to the punch, engages the gears and on the upstroke brings stops to position required for bend. The rack can be disengaged from the gears when the unit is being used as a single-stop gage. Gage stops can be arranged in the rotating member to meet a wide variety of bending requirements.

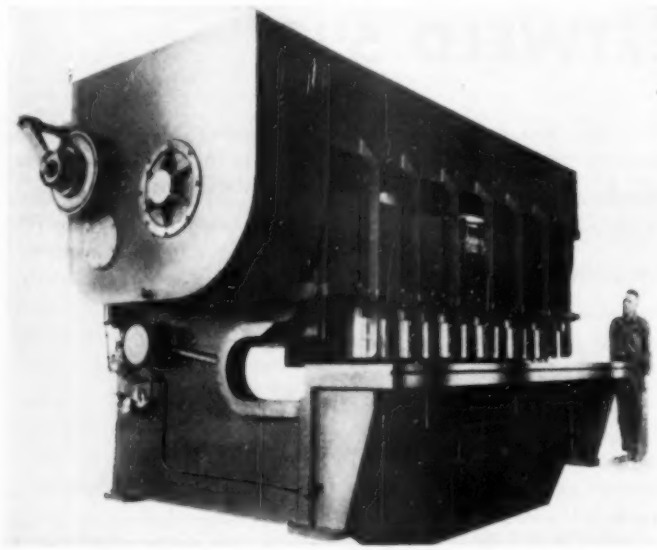
General Gas Light Co., 202 North Park St., Kalamazoo, Mich.

Control Indicator Provides Quick Check of Production Reject Rates

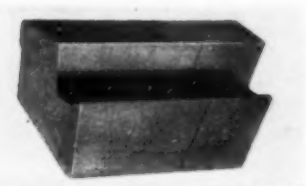
The Quality Control Indicator counts the number of items produced and the number of rejects. If rejects rise above a predetermined rate, a needle on the meter moves to the right, calling attention of supervisors to a production trouble spot. In practice a battery of such indicators would be located in a central spot away from production lines. Every time an inspector rejects an item he presses a button and the signal registers on the instrument. Rejection rates, usually made by statisticians, lag behind actual production. Such time delay is eliminated by this electric calculating machine.

On a compressor assembly line the reject rate was reported to have dropped from an average of 2.7 to 0.89% for a check of five characteristics in six months in the pilot installation of a quality control indicator.

General Electric, 1 River Road, Schenectady 5, N. Y.



GIANT STEELWELD SHEAR has a shearing capacity of 12 ft of 1-in. steel plate and cuts at rate of 25 strokes per min. A micro-speed knife adjustment facilitates quick change of knife clearance to suit varying plate thickness. This is done by hand crank while a dowel indicator shows clearance in thousandths of an inch. Pivoted-blade cutting principle eliminates slides or guides for the knife to work in. The throat is 24 in. deep—*The Cleveland Crane & Enginering Co., Wickliffe, Ohio*



Straight Form Tools Reclaimed by Butt Brazing

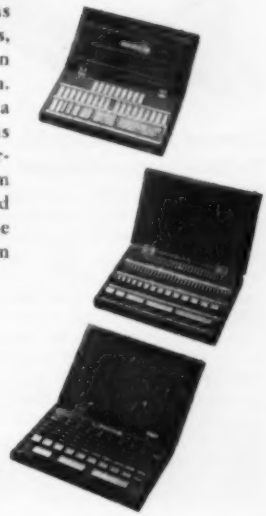
By butt brazing the unused ends of flat and dovetail form tools, worthless ends are brazed together to meet the new-tool specifications. The alignment and tensile strength of reconditioned tools is said to be equivalent to that of new tools.

Rutland Tool Service, 15006 Greeley Ave., Detroit 3, Mich.

HJALMER ELLSTROM, *(1863-1942)— Inventor of the Gage Block, originator of today's world standard of measurement. Patience was his creed, accuracy his goal. Working in Eskilstuna, Sweden during the early 1890's, he alone developed and perfected the instruments and techniques... then alone he created the first gage blocks accurate to the infinitesimal millionth part of an inch.*

An Ellstrom Measured in Millionths more than half a century ago—

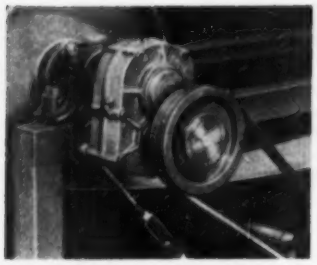
Ellstrom Chromium Plated Gage Blocks have been described by users as "the best all-around gage block in the world." And for good reasons, too. For aside from the fact that they wear 5 to 20 times longer than ordinary steel blocks, they bring you an unparalleled heritage of precision. It was an Ellstrom who invented the original gage blocks accurate to a millionth part of an inch. And it was an Ellstrom too, three generations later, who first applied chromium to gage blocks to give you longer wearing millionths without loss of accuracy. Today, every Ellstrom Chromium Plated Gage Block carries a positive guarantee of specified millionths. And this warranty, made without conditions or reservations, is backed by the entire resources of Dearborn Gage Company and the reputation of Ellstrom ... *measuring in millionths for three generations.*



DEARBORN GAGE COMPANY

22035 BEECH STREET • DEARBORN, MICHIGAN

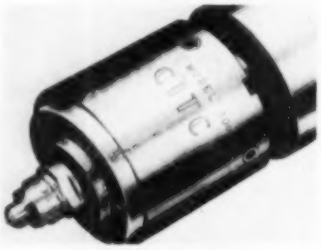
Originators of Chromium Plated Gage Blocks



Speed Reducer Operates in Output Range of 13 to 133 Rpm

The Torque-Arm speed reducer mounts directly on driven shafts and, through the use of stock sheaves, provides any output from 13 to 133 rpm. The unit consists of a reducer with a fixed ratio of 15 to 1 driven by a motor through any V-belt or flat belt drive. It contains a double train of helical steel gears, heat-treated and shaved. Steel locking collars on both sides of the unit lock it to the shaft; and a bushing, keyed into the sleeve, adapts the sleeve to any desired shaft size. A torque arm anchors the reducer and provides quick adjustment of belt tension by means of a turnbuckle. A backstop is available to prevent reversal of the load. The Torque-Arm speed reducer is made in six sizes with capacities up to 28.5 hp.

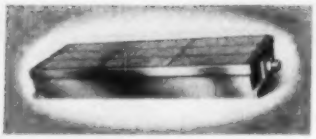
Dodge Mfg. Corp., Mishawaka, Ind.



Diamond Turner Adjustable To Three Ranges of Degrees

The Citco hydraulic diamond turner Model 1002-A, is adjustable to three ranges of degrees. It turns and holds diamonds rigidly, by hydraulic means, and generates, on the diamond, a consistent sharp edge in any one of three ranges, automatically repositioning the diamond every 3½, 7, or 10° respectively. Turning impulses are so timed as to automatically split the segment on the diamond face at the completion of the turning cycle to maintain a new cutting edge throughout the life of the diamond.

Cleveland Industrial Tool Corp., Cleveland, Ohio.



Vacuum Chuck Holds Non-Ferrous Metals

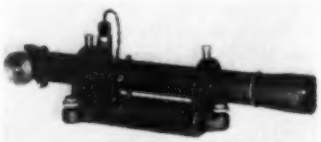
Brass, copper, aluminum, and other non-ferrous materials can be held in the Walker Vacuum chuck. The unit is designed to operate at a 23-in. vacuum, at which it is said to exert a total force of 1400 lb on a 1x2-ft piece of material. The ratio of suction area to that of the supporting members, on the face of the chuck is 1 to 1. The unit is reported to operate satisfactorily at a 15-in. vacuum. The high coefficient of friction of vacuum chucks is said by manufacturers to reduce sliding of work in comparison to magnetic units.

O. S. Walker Co., Inc., Worcester, Massachusetts.

Rotary Work Aligner Adaptable For Centered, Uncentered Work

This aligner can handle either centered or uncentered work and checks alignment or runout on any circular material from ¼- to 24-in. dia. At present four models are being produced in bed lengths from 5 ft 10 in. to 11 ft 6 in., with a load capacity of 1500 lb.

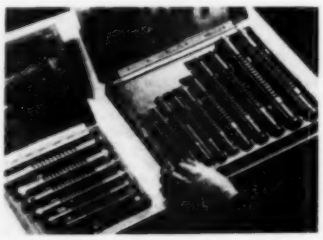
Johnson Machine Works, 619 Menomonie St., Eau Claire, Wis.



Auto-Collimator Checks Surfaces, Angle Measurements

The Watts 18-in. Auto-Collimator produces parallel rays of light and measures to within ½ sec of arc any deviation between the original direction of the beam and its reflection by the polished surface. It is said to produce a chart showing waviness in a surface plate, machine bed, or shaft to an accuracy of better than 0.000004 in. Used with gage blocks, angle-gage blocks, reflecting squares, or mirrors, a large number of accurate angular measurements can be taken directly. Linear measurements can be determined by simple computation without regard to distance.

Engis Equipment Co., 431 South Dearborn St., Chicago 5, Ill.



Broach Set Facilitates Cutting of Precision Keyways

Toolroom set No. 10 contains $\frac{3}{8}$-, ½-, $\frac{5}{8}$-, $\frac{3}{4}$-, $\frac{7}{8}$-, and 1-in.-dia Glenny push broaches. Toolroom set No. 15 contains standard Glenny broaches of $\frac{3}{8}$-, ½-, $\frac{5}{8}$-, $\frac{3}{4}$-, $\frac{7}{8}$-, 1¼, $1\frac{5}{8}$-, and 1½-in. dia. All broaches in these sets have protected-blade design and are said to provide chatter elimination, absolute centering, maximum adjustment for depth of cut, interchangeable blades, and rapid keyway cutting. Each broach will accommodate three or four different blade widths.

The Kase Machine Co., 18422 Buffalo Ave., Cleveland 19, Ohio

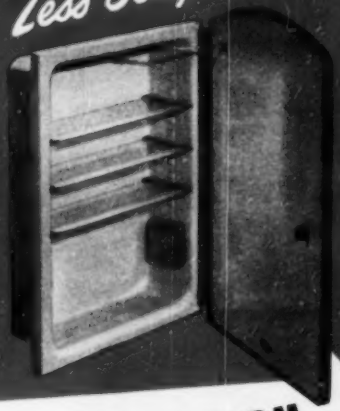
Adjustable Parallels Hold Tools, Dies, Fixtures

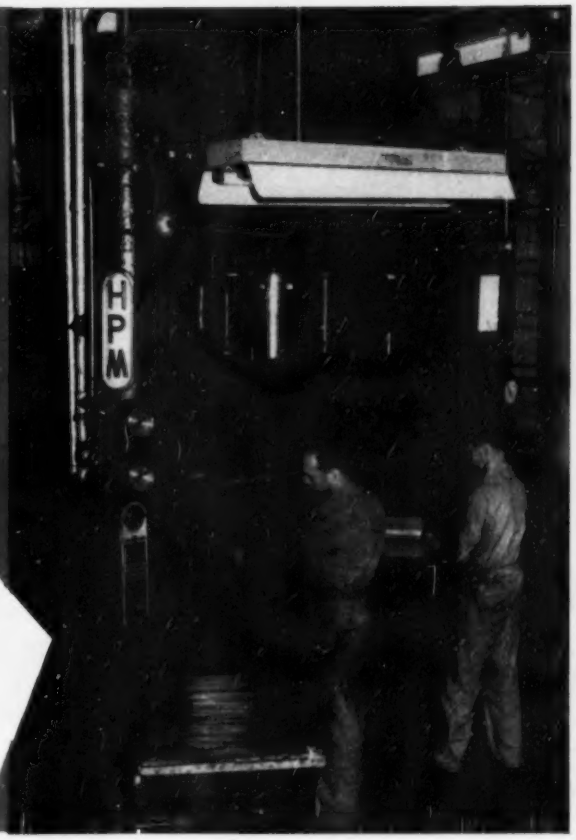
For holding tools, dies, and fixtures of all kinds for drilling, counterboring, tapping, grinding, assembling, checking, and welding, these adjustable parallels are offered in the following sizes: Height 4 in., length 10 in., and width adjustable from 3¼ to 11¼ in.; height 6 in., length 12 in. and width adjustable from 3¾ to 13½ in.; and height 6 in., length 18 in., and width adjustable from 4 to 20 in.

Tinker's Thread Grinder Co., 136 Granby Road, South Hadley Falls, Massachusetts.

High Quality Parts!

Less Scrap Loss!





DRAW-TRIM-FORM RETURN FLANGE...ALL DONE IN A SINGLE PRESS STROKE!

Another H-P-M Production Record!

When F. H. Lawson Company installed an H-P-M deep drawing press to take over the production of bathroom cabinet bodies, three important things happened.

1. **One press replaced two—eliminating costly material handling time.**
2. **Substantial reduction in scrap.**
3. **Improved product quality without sacrifice of rapid production rate . . . six cabinet bodies per minute!**

Here again is a typical example of how H-P-M's all-hydraulic operation, fast cycle and automatic control are making money for many prominent manufacturers.

Call in a nearby H-P-M Engineer and have him show you how H-P-Ms can do the same for you.

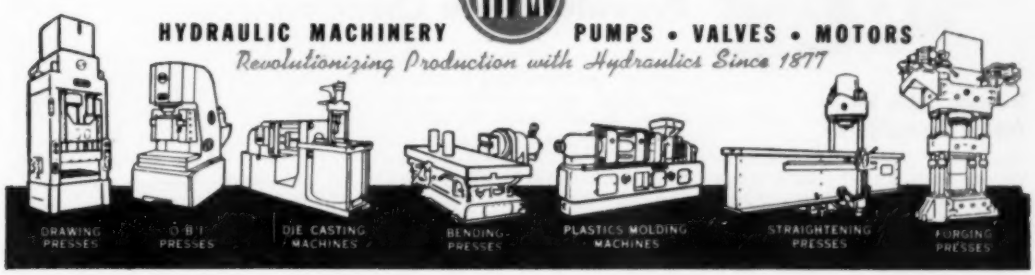
THE HYDRAULIC PRESS MFG. CO., 1002 Marion Road, Mount Gilead, Ohio, U.S.A.

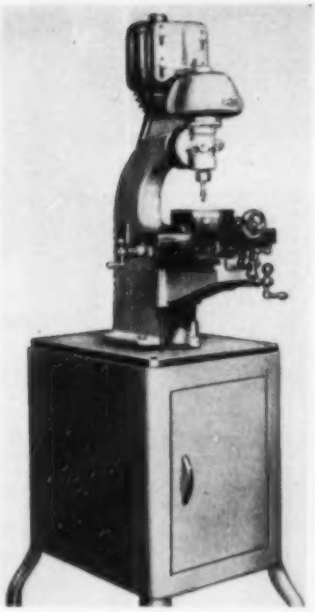
Read the Lawson story recently published in STEEL. Write today for a reprint.

HPM

HYDRAULIC MACHINERY **PUMPS • VALVES • MOTORS**

Revolutionizing Production with Hydraulics Since 1877

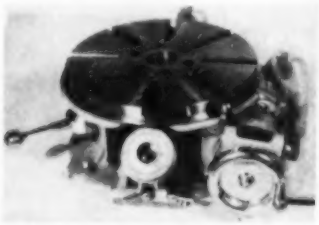




Vertical Milling Machine Built With Swivel Head

The No. 1 Columbia milling machine is precision machined to hold tolerances up to 0.001 in. Milling, drilling, boring, and routing can be done at any angle. The adjustable swivel head will turn on a 180° radius. Spindle is equipped with tapered Timken bearings which carry radial and thrust loads and are said to transmit maximum power to the cutter at any angle. A wide variety of spindle speeds are said to be available. Standard bench model is priced at $323 fob Grayslake, Ill.

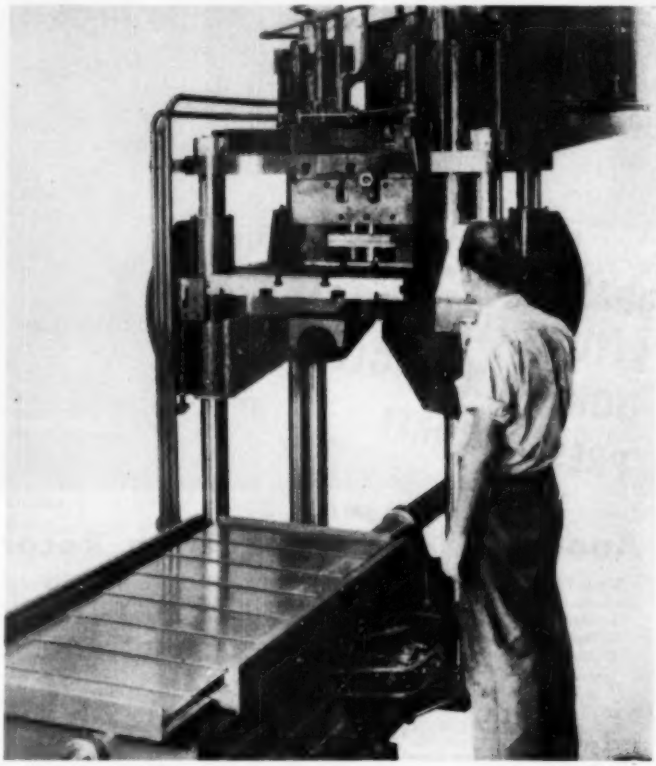
Columbia Enterprises, Inc., Grayslake, Ill.



Indexing Table Set by Optical Control System

All settings of the OPL indexing table are made with the aid of a system of lenses, working in conjunction with a master reference drum carrying 360 finely engraved lines equally spaced about its periphery. The table platen is rotated until the reference line, representing the number of degrees of moment desired, is centered between two parallel graduations, engraved on the reticle in the optical control. For small movements this reticle can be moved by rotation of a micrometer dial graduated in 32 increments. Spindle runout is held to within 0.0002 in. and maximum error of indexing is said not to exceed 0.0005 in., measured at the periphery of a 12-in.-dia circle. Spindle and turntable of the unit are mounted in such a manner that loads are taken at the turntable periphery and not by the anti-friction bearings. The indexing table is built with a spindle-locking clamp which cannot impart movement to the turntable, but is said to resist heaviest machining vibrations. The turntable diameter is 11½ in., over-all horizontal height 6 in., over-all vertical height 13¼ in., swing in the vertical position 12¼ in., max dia through spindle is 1½ in., and the unit weighs 125 lb.

F. T. Griswold Mfg. Co., 305 W. Lancaster Ave., Wayne, Pa.



Die-Testing Machine Provides Close Checking

Lester die-testing machine is said to open and close dies so that the parting line can be matched perfectly before the die leaves the toolroom. The two halves of the die are clamped to the two machine platens. The bottom platen first moves down and then moves horizontally. The die is then at a convenient height, out in the open, so that it can be easily reached and worked on. It is next moved up in alignment for checking. No pit is required to accommodate an oil cylinder. Vertical travel is 36 in., and the machine will fit under a 10-ft ceiling. The horizontal stroke of the die table is 52 in., and the table size is 28x58 in. The machine weighs approximately 15,000 lb.

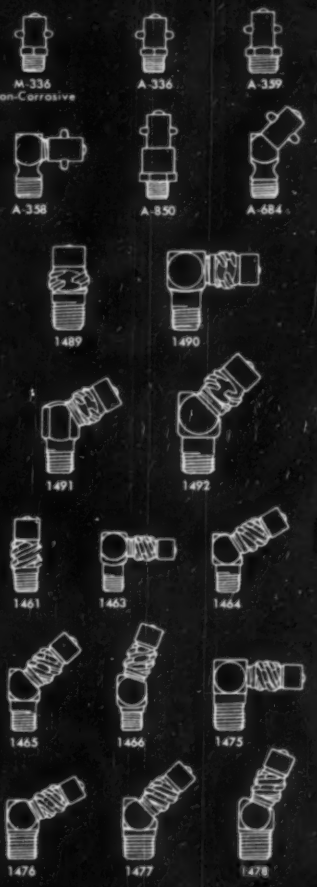
Lester Engineering Co., 2711 Church Ave., Cleveland 13, Ohio

Genuine ALEMITE LUBRICATION FITTINGS

DATA SHEET NO. 3

Useful Information to Help You Select and Specify the Right Alemite Fitting for Every Bearing

Simplify ORDERING, INSPECTION and INVENTORY CONTROL. Specify Alemite part numbers on your blueprints.



PIN TYPE FITTINGS

The original lubrication fitting developed by Alemite. Named after the positive locking of the Pin Type Coupling on the cross pin of the fitting.

PART NO.	THREAD SIZE	FITTING ANGLE	LENGTH OVERALL
A-336	⅛" P.T.	Straight	1"
M-336	⅛" P.T.	Straight	1"
A-339	⅛" P.T.	Straight	1 $\frac{5}{16}$"
A-358	⅛" P.T.	90°	1 $\frac{1}{16}$"
A-850	⅛" P.T.	Straight	1 $\frac{21}{64}$"
A-684	⅛" P.T.	45°	1 $\frac{3}{16}$"

MOGUL DOT FITTINGS

Similar to the Dot Fittings above, except larger and more rugged to withstand hard industrial use on heavy machinery.

PART NO.	THREAD SIZE	FITTING ANGLE	LENGTH OVERALL
1489	¼" P.T.	Straight	1 $\frac{1}{16}$"
1490	¼" P.T.	90°	1 $\frac{21}{64}$"
1491	¼" P.T.	60°	1 $\frac{21}{32}$"
1492	¼" P.T.	45°	2"

STANDARD DOT FITTINGS

Commonly used on heavy duty machinery such as contractors' equipment, wood working machinery, canning machinery, etc. Gun coupling screws on to the fitting thread, making a positive seal.

PART NO.	THREAD SIZE	FITTING ANGLE	LENGTH OVERALL
1461	⅛" P.T.	Straight	1 $\frac{21}{64}$"
1463	⅛" P.T.	90°	1"
1464	⅛" P.T.	60°	1 $\frac{21}{32}$"
1465	⅛" P.T.	45°	1 $\frac{21}{32}$"
1466	⅛" P.T.	20°	1 $\frac{21}{32}$"
1475	¼" P.T.	90°	1 $\frac{3}{16}$"
1476	¼" P.T.	60°	1 $\frac{1}{16}$"
1477	¼" P.T.	45°	1 $\frac{21}{64}$"
1478	¼" P.T.	20°	1 $\frac{7}{16}$"

ALEMITE

Modern Lubrication Methods That Cut Production Costs

FREE! Complete set of four Data Sheets similar to this, giving specifications on all types and sizes of Alemite Lubrication Fittings. Simply write to Alemite, Dept. D-20, 1850 Diversey Parkway, Chicago 14, Illinois.

Another Product of STEWART WARNER

Quite frankly we do not intend to "mechanize" the above marking operation. We doubt that any machine would give as much satisfaction as the old-fashioned method. But the Noblewest Model 279, illustrated, does mark the case of the lipstick used by the young lady who left her mark. And more important to you is the fact that this addition to the Noblewest line can be tooled for marking a large variety of products in metal, plastic, hard rubber, wood, etc. Employs the famed Noblewest roll marking process. The inscription (including the delicate decorative design) is permanently rolled in—lasts as long as the product itself. You, too, can mark your products faster, better, cheaper with Noblewest Production Marking Equipment. Write NOBLE & WESTBROOK MANUFACTURING CO., 17 Westbrook Street, East Hartford 8, Conn.

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EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

ROUND TABLE Discussion

ROLLING STONE

Bearing in mind the old adage that a rolling stone gathers no moss, one would suppose that moving around from job to job sharpen's a man's powers of observation and makes him quicker on uptake where new methods are concerned. On the other hand, with the man who "stays put," there is a tendency for him to become fixed in his ideas and to dislike trying new methods.

While that supposition could only be accepted on a very broad basis, it is logical that a man who has worked in a number of shops should have a wider knowledge of shop practices than one who has worked in the same place all the time. Granted that the latter may be better at his own particular job, the former is probably more useful, except on specialized jobs where long experience is essential.

Again speaking generally, the man who moves around is usually a "go-getter." He develops self-confidence and is not afraid to tackle something different. He is of the adventurous type and his mental capacity is generally keener than that of the one-shop man.

On the question of which of the two is to be preferred, much depends on the rolling stone's reasons for rolling. If he has a profound dislike for work and quickly loses interest in his jobs—just let him keep on rolling. But if the itch to move around is prompted by the desire for better pay, to acquire knowledge of different methods and processes or even to see other towns and people he is worth having.

Admittedly such a man is usually somewhat difficult to handle. His ideas about discipline are sketchy and he is liable to down tools over a slight difference of opinion, with the result that at times he can be a very disturbing influence. Despite this, if he does roll back again—and provided his previous departure was not due to serious misbehavior—the question of rehiring him is worth consideration. He will undoubtedly have gained further experience and it may well be that his rolling momentum is slowing down. It will stop eventually; an almost certain cure is marriage.

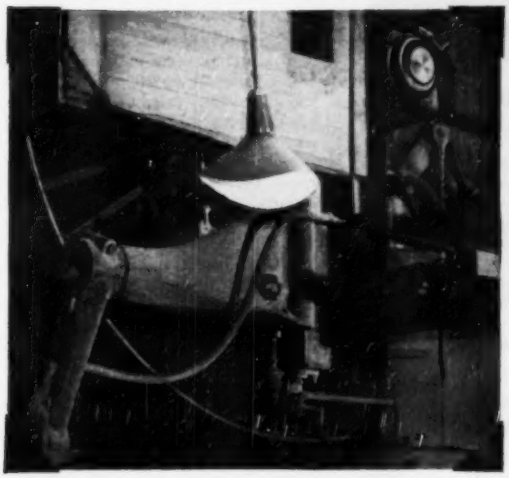
Another potential brake on rolling is that exercised by pension and social security schemes. In my opinion

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT	Calol Vistac Oil
UNIT	Main bearing-Sawmill Head-Rig Wheel
LUBRICATOR	Drip-feed oiler
CONDITIONS	Heavy pressures and tension—intermittent loads
PERIOD	2 years
FIRM	California Door & Lumber Co. Diamond Springs, California

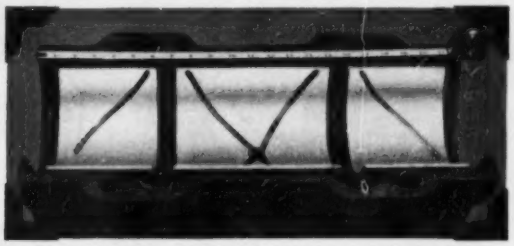
Tacky oil stops heavy-duty bearing failures



LUBRICATED WITH CALOL VISTAC OIL, the bearing in the 7-foot wheel of this head-rig has been in continuous use for more than two years. Before the sawmill changed to CALOL VISTAC Oil, the bearing had to be replaced every few months.

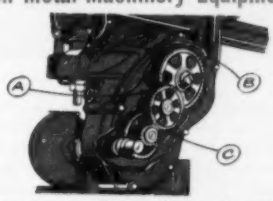
Mr. William Liddicolt, Mill Superintendent, says, "CALOL VISTAC Oil sticks tight, lubricates the entire bearing surface and doesn't squeeze off even under loads of 20,000 to 50,000 pounds. I also use CALOL VISTAC Oil on bearings in slashers and the hog. It really stands up under the continuous shock loads on hogger bearings!"

REMARKS: This plant has two band mills with 60-foot saws; handles heavy pine and fir timber. By keeping the bearings in these mills in good condition, CALOL VISTAC Oil has not only cut operating costs but prevented possible injury to personnel from saws that usually break when bearings go out.



THE HEAD-RIG WHEEL BEARING in this mill is 7" in diameter, 21" long, babbitt lined, and has two oil rings. Because CALOL VISTAC is tacky, it carries over bearings, keeps tops lubricated, maintains a rust-proof coating during shutdowns.

How CALOL VISTAC Oil Cuts Costs on Metal-Machinery Equipment



Saves wear, prevents failure of bearings and gear trains in machine tools and press machinery; excellent air-tool lubricant. Note diagram of hoist gear unit for overhead crane:

A. Special additives in CALOL VISTAC Oil help form oily, pressure-resistant lubricating film.
B. Economical — small quantity will lubricate efficiently, dissipate heat.
C. Tenacious film cuts power loss and wear.

FOR MORE INFORMATION about this or other petroleum products, or the name of your nearest distributor, write or call any of the companies listed below.

Trademarks, "CALOL," "VISTAC" Reg. U. S. Pat. Off.

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TO CUT REAMING COSTS!

1 LESS TOOL COST! W-S complete line of carbide reamers covers over 90% of reaming jobs. Reduced inventory!

2 GREATER ACCURACY! Precision tolerance as close as .0001. Lapped and protected grinding centers for more accurate resharpening.

3 BETTER FINISH! Grinding operations eliminated. All W-S reamers have diamond-lapped cutting edges and special hardened steel bodies stress-relieved before brazing.

4 IMPROVED DESIGN! New type of tool construction. Highly polished flutes with greater chip capacity.

Rely on the famous W-S complete line of carbide reamers — tried and proved for 15 years — to improve production at LOWER COST! Complete range of sizes . . . wide selection of styles . . . straight or taper shanks of hardened steel. Quick delivery on standard reamers with special diameters and tolerances. Make your next reamer order a W-S order . . . see your Wendt-Sonis distributor.

Free! NEW REAMING INSTRUCTION CHART

Determines speed and horsepower for cutting steel, ferrous, non-ferrous and non-metallic materials. Write today: WENDT-SONIS COMPANY, Hannibal, Missouri — 580 North Prairie Avenue, Hawthorne, Calif., 549 West Randolph, Chicago, Ill. Warehousing Facilities: Eastern Carbide Corp., 909 Main St., New Rochelle, N. Y.

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DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS
ROLLER TURNING TOOLS • SPECIAL BITS

these possess the negative virtue of tending to discourage movement of workers from shop to shop owing to great numbers of them not wishing to forfeit the benefits through moving around. It is not good for an industry that people should stagnate in one shop all their lives. By so doing their opportunities for gaining practical experience of other manufacturing methods and processes are very limited, often to their own detriment and that of the company from which they draw their pay.

O. Lewis
Luton, England

•

PAYING—OR PAID—GUESTS

IT MAY APPEAR presumptuous for a man, who has never met the vacation college student, as such, to butt in on the question as to whether such people pay or are encumbrances. He is certainly unable to speak from experience. Seeing, however, that results canot be reaped immediately, they become problematic and the thoughts of one interested theorist can be as useful as those of another.

It is suggested that the term "paying" could be made more definitive. If the underlying thought be that such students earn their wages as workmen then, if they be given skilled work to do, the answer would most likely be a definite no. In fact, in view of their strangeness to the shop, the routine and the work, on the basis of actual cost they would probably be a definite loss. This, however, would appear to be taking a not very enlightened view. The object should be not so much one of immediate profit as of a seeking for future staff; an investment for future personnel. The brains, common sense, adaptability and personalities of these youths could be appraised and the more acceptable sounded as to the careers they wished to follow and, if thought desirable, an offer made to consider an application for employment when college days were over.

The selection of promising youths should always be in the minds of executives, whether from college or errand boys and an opportunity to know such at close quarters ought never to be missed. Viewed as prospective candidates for employment doing best work to "show their paces", there would be little doubt that the employment of the vacation student would be found to be a paying proposition, not less so if some candidates had to be rejected. It is well not to forget that the Watts, Stephensons, Edisons, Fords were

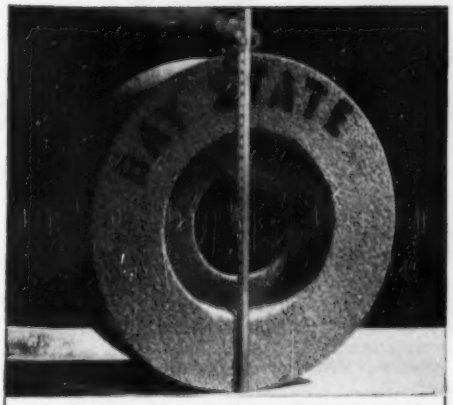
Eighth in a series of
Unusual Grinding
Wheel Operations

Grinding Wheels "Make Music"

● SMALL NEEDLES — LARGE GRINDING WHEELS

Phonograph needles are but one of the many types manufactured by the W. H. Bagshaw Co., Lowell, Mass. The large specially designed BAY STATE wheel, as illustrated, is being used successfully by them for the tapering operation.

Pointing steel phonograph, surgical or knitting needles may not be your grinding problem, but whatever it may be, Bay State can help you solve it . . . fast. You may find the exact specification to meet your requirements either from our large stocks in Westboro, branch warehouses or from our distributors. Write us if you do not know the location of our representative nearest you.



Typical Needle Grinding Wheel
32" x 10" x 10" (Concave Face)

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.

Branch Offices and Warehouses —
Chicago, Cleveland, Detroit, Pittsburgh.
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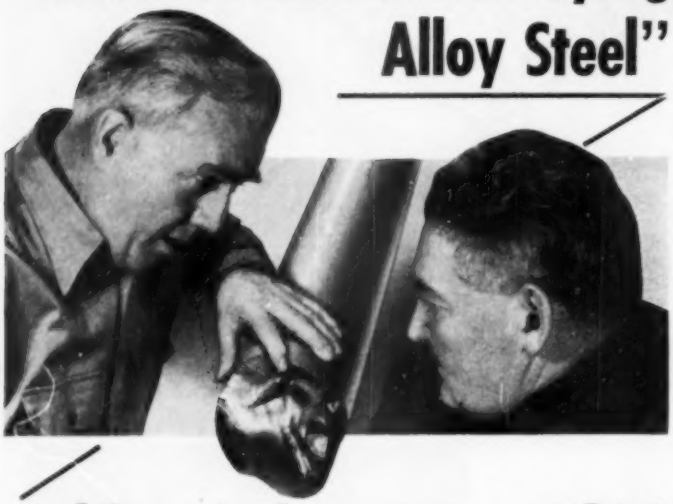
BAY STATE®

MEMBER OF THE GRINDING WHEEL INSTITUTE

Top Performance Consistently Duplicated

"There's a Hazard in Buying Alloy Steel"



and here's how to avoid it!

You may specify and buy alloy steels for years without a slip-up — without getting the wrong specification—without a breakdown or accident.

But many men and machines handle your alloys before they come to you. That means many chances for error—for a mistake — possibly with serious consequences.

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once college students, errand boys and the like; winners are worth spotting but they are not labeled.

J. E. Powell
Lincoln, England

•

BLOWING OFF STEAM

There are times when a foreman finds it necessary to unburden his soul to someone whom he feels will not betray his confidence. Were he a superman he could possibly contain himself without ripping his seams and let the healing power of time dissipate those troublesome pounds of annoying gripe. If he feels confident that one of his subordinates can absorb his feelings and let the information go no farther he may accomplish his purpose. However, on account of the weakness of human nature, said confidant usually finds it necessary to disburse his own inner pressure so as not to blow up himself.

There is a devilish streak in the most of us and we are only too prone to exercise it for the sake of getting a laugh at the expense of another. I can picture Reynolds, as he sits on the bench with his buddies at noon, screwing up his mouth as he leans over to another nearby and letting the precious words entrusted to him slip out about Billings. The chances are that Reynolds may be the recipient of Ed's wrath one of these days and when that happens Ed's harsh words will irritate his tonsils so much that he'll shift into overdrive and start to spill corrosive words to others. If there ever was a slogan created especially for foremen it is the old "Familiarity breeds contempt."

Confiding in one of his men about some fault in another is in a sense a form of familiarity which leads to future trouble. If Ed were strictly honest he would say what he has to say to the party direct and not lower himself in the eyes of another.

John Homewood
Ontario, Calif.

•

In my opinion a foreman who has the habit of belittling an employee through a third person does not know the fundamental principles of good human relations. One of the first things a supervisor should learn is to whom he speaks, of whom he speaks, and how, when and where.

When the supervisor gripes to an employee about someone else, the employee naturally assumes that the foreman will do the same thing to all. Certainly no part of the management can continually find fault and hope to get co-operation from the

Mites in Size; Mighty in Power

NEW SCHRADER BANTAM-SIZE AIR CLAMPS

BASE MOUNTED TYPE SHOWN
(Leg Mounted Type also Available)

WEIGH LITTLE
COST LITTLE

Do you know what a tremendous saving in time and muscular effort can be made by using Air Clamps for holding work in position to be processed? Air Clamps have obsoleted manual or mechanical devices for holding work. And here are the Air Clamps that make *every* application practical and economical.

The new Schrader bantam-size Air Clamps save space—they pack all the power possible into the least dimensions; Piston and body are ruggedly constructed for long, hard use. Body is of precision-machined cast brass—easily maintained. And Schrader Air Clamps are adaptable to practically any type of application. There are two types of mountings, base or leg; six models in each type—strokes of 1 to 2 inches; cylinder diameters—1", 2¼" and 3".

There's a Schrader Air Clamp for every application and they weigh so little and cost so little you need not hesitate to design them into production machines with confidence.

Write for a complete catalog data sheet today.

NEW THREE WAY VALVE This valve is especially designed for use with above cylinders. The valve body houses a precision lapped stainless steel disc which slides on a bronze ring providing positive sealing action—featuring ease of maintenance. Can be operated manually or mechanically.

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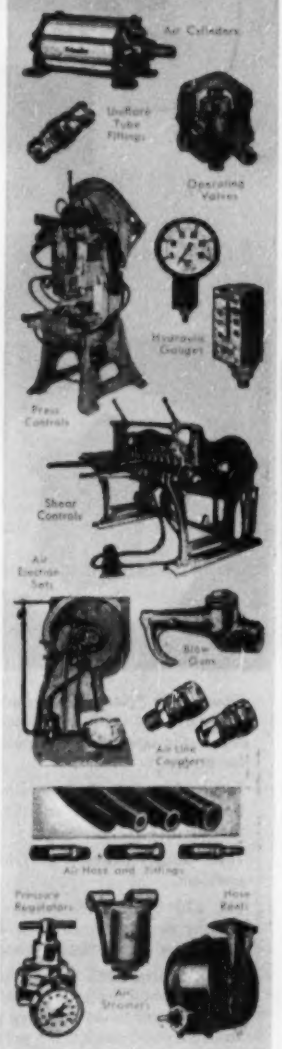

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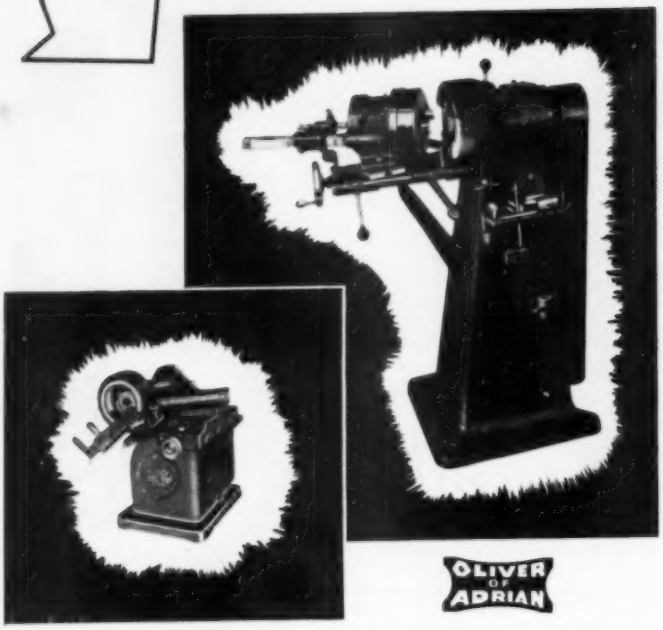

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Today one of the industry's most insistent problems is cost reduction. The battle for competitive sales advantages can be won or lost in your own tool room.

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workers. We must acquire the attitude of criticizing conditions, situations and things and not the individual workman. Our degree of success in handling people is measured by a thoughtfulness of other fellow's feelings and a desire to correct the faults. Everyone will defend immediately an attack on his self respect, and the leader who is always complaining will soon find it becomes general knowledge. Such a boss lacks patience, tactfulness and sincerity. If there is some one thing which annoys the supervisor he should first find out the reason and then calmly consider the best way to handle it. To solve knotty problems, to get suggestions, correct faults and to get production and quality the supervisor must have the respect of the employees working for him. He must be considerate of faults and must instill in the employees the knowledge that they are all working together as a unit toward this mutual advantage. To think clearly we must be calm, and in this way control our inner feelings.

A. E. Salmons
Philadelphia 29, Pa.

•

In cases where Reynolds may be an assistant or leader under the foreman, it may be unavoidable to blow about Billings over some delay or blunder. It will come out at times where a man like Billings proves a disgusting failure and a discussion may lead you to blow a little. However, I am not in favor of it among the rank and file of men in a shop for several good reasons. You never know when it's likely to backfire on you. Reynolds can think that if you talk to him like that about Billings, you might do the same about him. This kind of opinion has just one summary among shop-men: It stamps you as a two-faced individual.

There is also the possibility of something going back to Billings when you don't want it to. Sometimes this will go back distorted with some things added to it just to get a man's goat (in a sort of horse-play kidding). Sum it up any way you like and nothing favorable is to be found in this kind of blowing off.

I consider a foreman lowers himself to blow off much and jeojardizes his integrity if it becomes known that he does this sort of thing. Few men will respect him for it. My plan has been to blow off steam when called for right to the man on the spot and have him get it straight and have it over with.

I have sort of taken men by surprise in my method of dealing with

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ORDINARY lubricants gum up at extremely low temperatures or break down at extremely high temperatures . . . but not Acheson's specially processed **"dag"** colloidal graphite!

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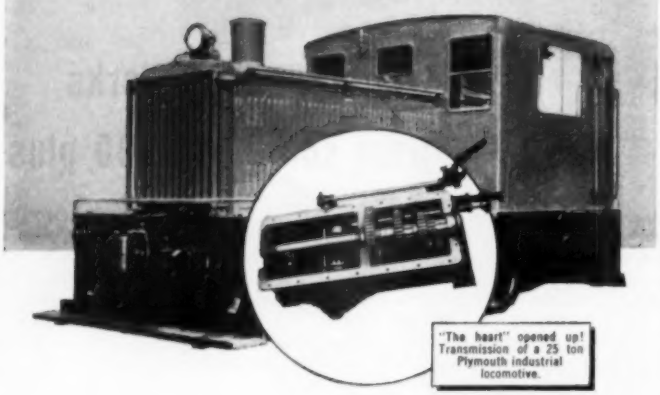

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UNITCASTINGS ARE FOUNDRY ENGINEERED

them in this way. If the occasion called for it, I blew off or scolded a little. Then in a few hours I have spoken very pleasantly to the man to let him see I was not harboring ill feeling toward him in a personal way. This also has a tendency to disarm the man of a feeling that you are hard boiled, etc. Yet he has observed that you are on your toes in directing your department.

This human type of management has paid me by respect shown by men under me. One employer some years ago referred to this in a reference for me, in which he wrote that I had perfect control of help. So keeping my own counsel and being fair, face to face, not blowing off to others about men or work as Ed did over Billings to Reynolds is the best policy.

Henry Rasmussen
Niagara Falls, N. Y.

•

Now we enter upon a very touchy matter—one that causes more hurt feelings than any that I can think of. Maybe it's because so many of us have consciences, and we think that the other guy is always out to do us some dirt. Every one of us has to blow off a little steam now and then, but to go to someone with talk of a fellow worker, watch out. There is danger ahead. The only real successful method is to blow off to the fellow who is the cause of the check-valve action. I am a firm believer in either saying to a man's face what I feel or not saying what I know will cause his boiler to take on new high pressures.

A good suggestion on this issue would be a shop discussion group, scheduled at a time convenient to the plant officials, where any individual could air his views and open them to group discussion. Usually when we see a fault in someone else, we are overlooking the real fault: ourselves. This type of discussion not only gives everyone interested a chance to voice his opinion, but also offers him protection in the eyes of his working companions. No one likes the "bee" type of individual that goes from machine to bench with stories about this fellow's faults and that one's odd ways. With proper guidance and leadership, any group of individuals can meet and iron out its difficulties and end the session with feelings unhurt.

It is true we do have individuals who can't stand to have their faults brought out into the open. And these are usually the ones who want to continue the whispering campaigns. After a few of these open sessions, it is my belief that they will be dis-

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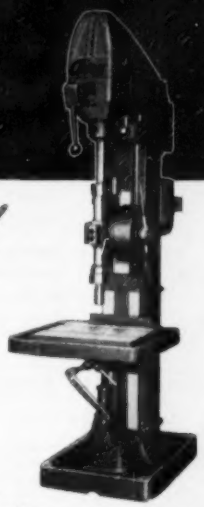
Production of 300-400 parts per hour can be easily achieved on a set-up like the one shown above.



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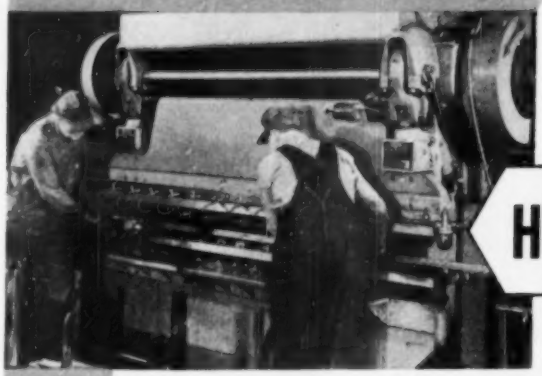
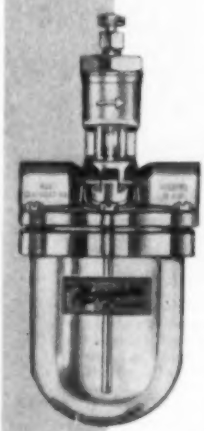
Life of punches INCREASED 50%



HOW?

Sunlight Metal Products Corp.—Denver manufacturers of quality steel sash—did the trick! Upon the advice of a Norgren representative, they installed a Norgren Oil Fog Lubricator and a simple distribution system on a punch press—to lubricate ***automatically*** each punch and stripper unit for ***every stroke***. Previously, the punches were lubricated by hand with a brush, only once in every ten strokes.

Here's a tip for machine designers and users to give their equipment more output and less upkeep by the simple and logical installation of Norgren Automatic Oil Fog Lubricators.



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- Compact, easy to install.
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- Stop oil waste; lubricate only when air flows.
- Check wear of tool or equipment in use; stop corrosion when idle.

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Also Filters, Regulators, Valves, Hose Assemblies

continued, not because of their lack of success, but because those finding faults will also be on the lookout for their own and realize that all of us are only human.

In saying something to a man's face, I never worry about his opinion of me being lowered. I know from experience that it grows and the respect is really worth the pain of making the decision. Give this method of control a chance and see if the men don't appreciate an honest appraisal of themselves when given the same opportunity to reply and state their reasons for such actions and how they feel on the matter. One caution that I will add is to limit these discussions to shop life. Leave the fellows home out of the shop. If he doesn't go to your church or drinks a different brand of beer on his day off, just realize that it is a free country and he is taking his freedom as he sees fit.

Jack Bell
Bakersfield, Calif.

•

It is hardly necessary to caution the wise foreman that it never pays to "indulge in personalities" with his subordinates. One of the attributes of a good foreman is his ability to keep his own counsel. The road to potential trouble is too often paved with good intentions. The foreman may have no ulterior motive in confiding in a subordinate while indulging in the innocent pastime of "blowing off steam." However, sad experience has usually demonstrated the fallacy of this practice.

If the foreman must get something off his chest and out of his system, he still has his fellow foremen to come to and unload his hypothetical burden.

The diplomatic foreman uses tact and discrimination in choosing the recipient of his confidence, and is guided in his choice by the nature of his confidential communication. Otherwise, confiding in one of his workers will interfere with the foreman's efficiency. Of course, the foreman should be human and act that way toward his men. But there is a difference in being human and in disclosing a weakness. When the foreman airs his views about another man in the shop, he is letting one man know that he has a grievance and thereby loses stature as a leader and efficient foreman in that man's estimation.

The desire to "beef" is human but "blowing off steam" to the wrong recipient is inexcusable in a foreman. When the foreman feels the need for "blowing off steam" the safest "safety valve" is another foreman. However,

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● *In 1937, Philip M. McKenna invented an entirely different, crystalline intermetallic compound ($WTiC_2$). This substance, as an ingredient in Kennametal cemented carbide, yields greater strength and hardness, and made it practicable to machine steel with assured economy.*

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Money . . . like tools . . . demonstrates its worth by its performance. The performance record of "fiat" money reveals its dangerous lack of stability. It is destroying the savings of the country and with it the freedom of all.

● *Sound money was abandoned in 1933 when the government seized all gold and devalued the dollar by 40%. It could then print as much paper money and bonds as it chose. No one could plan for the future with such irredeemable money . . . neither the manufacturer nor the saver.*

The inherent worth of the dollar has depreciated constantly since 1933. The bond you purchased in 1940 has lost over half of its purchasing power. Our freedom is being taken away bit by bit by the embezzlement of your savings. Taxation is at the breaking point.

Restoring the gold coin standard now will effectively restrain deficit spending and stop encroachments on your freedom. The performance record of fiat money in all history shows that the people have always suffered great loss. Human liberty rests on gold redeemable money.

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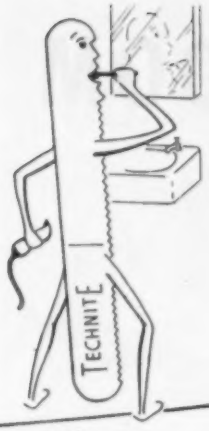

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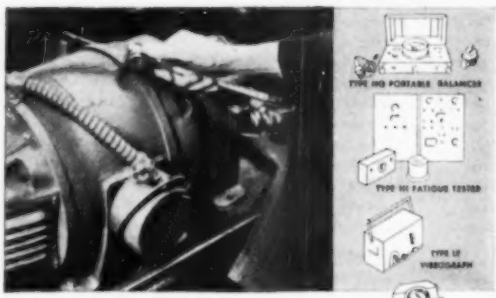

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Measure Vibration
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Track costly vibrations with inexpensive tools. The Westinghouse Types MH and JC-1 Portable Vibrometers are instruments that supply immediate readings of amplitude and frequency respectively. They provide data essential for elimination of harmful vibration. For complete information on this and other vibration testing equipment, write Westinghouse Electric Corporation, Department E-3, 2519 Wilkens Avenue, Baltimore 3, Maryland. J-02211

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VIBROMETERS

it might be a good idea when the foreman feels like "blowing off steam" about the faults of one of his men to take time to count ten—faults of his own. There's potential dynamite in advert admissions to another worker of the faults of one of his friends.

One of the advantages of a "side-kick" is that such a friendship on the part of one foreman for another offers a safe sounding-board for all the minor kicks and petty irritations of the day. To confide criticisms of one worker to another will do much to destroy the close-knit working setup in a shop by promoting disunity and misunderstanding between the workers and foremen. It certainly invites trouble.

Of course, it would be ridiculous to expect the foreman to go to his "side-kick" every time he felt the desire to "blow off steam," but there is no rule that prohibits harmless beefing to a disinterested third party. It is suggested that instead of dissipating his energy by "blowing off steam" about the faults of one of his subordinates, the foreman should exercise the true functions of his position and endeavor to correct the trouble. He should not hesitate to do all possible in his power to get at the bottom of the difficulty and try to iron out the sore spot with the worker involved before airing his troubles with a third party. Of course, where the difficulty seems insoluble of solution, two heads may prove better than one, and by teaming up with his associate foreman, in an effort to handle each others' questions, both may derive benefits from their efforts.

"Blowing off steam" to the wrong listener may have the same deleterious effect as a twice-told piece of malicious gossip that benefits neither the originator nor the subject of the tale.

Harry Kaufman
Philadelphia, Pa.

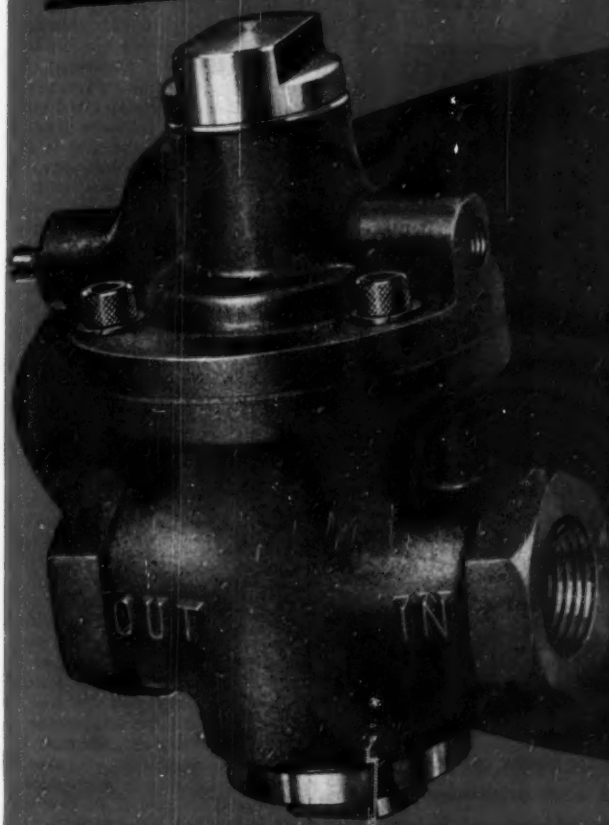
•

PLANNING COMMISSION

This discussion between Al and Ed reminds me of something I have read recently. A man would not wear suspenders to support his pants because his pants never did anything to support him. According to the wording of this discussion, I would string along with Ed. It seems to me that Ed is not trying to prove anything. He is simply examining the fact to prevent trouble.

As a foreman for a good many years, I know we must keep a constant check on all machines and parts. We must plan ahead on what may happen to our tooling and in

New ROSS "Water-Saver" Valve CUTS COOLANT COSTS!



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The Ross "Water-Saver" or Time Delay Valve is the answer. It turns on the coolant and lets it run when needed then automatically shuts it off. The flow can be maintained for any period from 3 seconds to 3 minutes after the machine cycle.

Operation of the valve is entirely automatic. No electrical or mechanical motivation is required since it is activated by cylinder pressure.

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Speed, feed and indexing can each be set independently of the others. This feature, plus the wide range of Hob Spindle speeds (109 to 1259 R.P.M.), provides the machine with extra versatility; cuts set-up time far below previously acknowledged minimums and permits easy adjustment of speed and feed to the requirements of material being worked or gear size being hobbed.

The ideal Gear Hobber for use in shops where set-ups are frequent or in shops where runs are long.

For full information write for our new Bulletin H 1-49.

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that way anticipate trouble before it develops. When parts become worn they affect related parts and cause poor quality or a complete breakdown. If I were in Ed's shoes I would call the maintenance foreman, plant engineer and works manager to get their angle. After a general exchange of views on what these machines need or the replacement of machines the Big Boss should be notified of their findings. General discussion should then decide procedure of:

(1) Buy new machinery (2) Buy new parts (3) Make new parts (4) Other repairs and maintenance.

I do not think however that Ed should go direct to the president without first discussing his problem with the executives mentioned. Ed might find that by fighting you never get enough, but by yielding and talking it over he may get more than he expected. It is not reasonable to expect that all six machines would need replacing at the same time or that they would all be worn out to the same degree. However if the combined findings of the foreman, maintenance foreman, plant engineer and works manager show that either machines or parts need replacing, the Big Boss will realize it will be cheaper in the long run to replace them.

A. E. Salmons
Philadelphia, Pa.

•

When a supervisor feels that he can increase the quantity or improve the quality of the product by installing new equipment, he should contact the machine tool dealers and compare their offerings. If a certain tool arouses interest, he should inquire where he may see one in operation. By chatting with the foreman of that concern, he will learn if the machine meets specifications. When he feels satisfied that this is the machine he needs in his department, he should prepare a report listing the cost of the new machine, the scrap value of an old machine, the estimated increase in production or decrease in scrap, and by simple mathematics, determine if the cost of the new machine is justified. Should his figures show that the increase of production doesn't cover the depreciation of the new machine, he can forget the whole thing. The accountant will show him how to figure whether a new machine will pay for itself in a short time.

Some foremen are under the impression that old equipment should be classified as obsolete. This is erroneous since in most cases a new machine is in principle the same one with new gears, shining parts and a good paint job. Its performance is

A MEDIUM-SIZE LATHE

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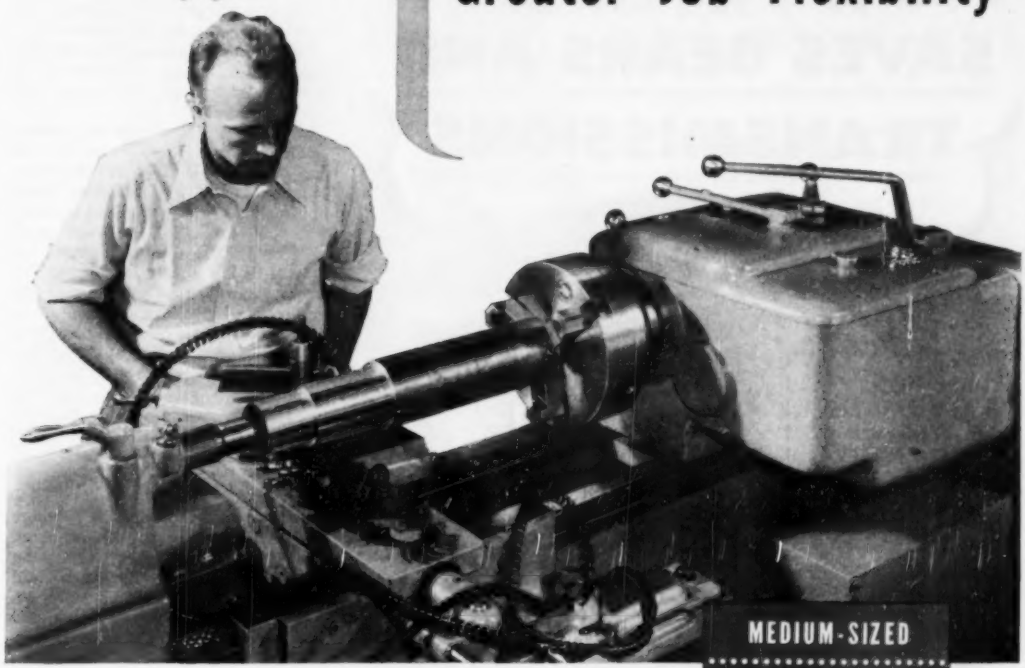
Practical Production Size
Greater Job Flexibility



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Built in 16" and 18" sizes for long service, these lathes have sufficient weight and power for high production, with accuracy requirements for tool room work, speeds for carbide machining and capacity for heavy cuts. Check for yourself the outstanding features provided in this *Medium-Sized, Economy-Priced* Lathe. Send for Bulletin No. A-900-4.

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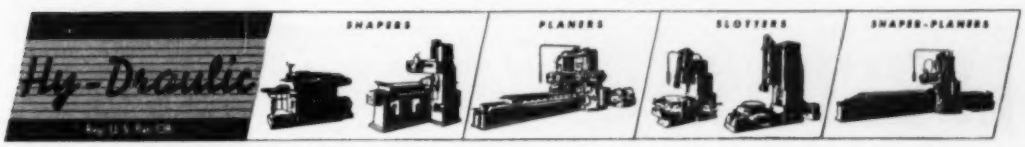

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—says AUTOMATIC WASHER COMPANY
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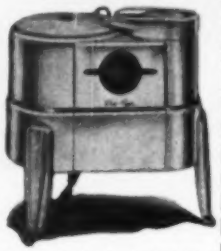

They write us.

"We have used LUBRIPLATE in our washing machine transmissions since 1933. Our laboratory tests as well as field experience indicate that through the use of LUBRIPLATE we reduced the wear on the gears and prolonged the life of the transmission.

"The transmission is the heart of any washing machine, and the long life and trouble-free performance obtained by the use of LUBRIPLATE in the Automatic Washer transmission has been an important factor in the success of our product."

AUTOMATIC WASHER COMPANY
F. Breckenridge
Executive Vice-President

The use of LUBRIPLATE in a washing machine is a severe test. Bearings and parts are subjected to moisture, hot water, caustics and sometimes acids. A lubricant to give efficient lubrication under these conditions must be an unusual product.

LUBRIPLATE Lubricants reduce friction and wear, prevent rust and corrosion, save power. Because LUBRIPLATE Lubricants last longer, they are more economical to use.

Let us send you CASE HISTORIES of the use of LUBRIPLATE Lubricants in your industry. There is a LUBRIPLATE product best for every lubrication need. They range from the lightest fluids to the heaviest greases. They are different from any other lubricants you have ever used. Write today for further information.

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Fiske Brothers Refining Company
Newark 5, N. J. Toledo 5, Ohio

DEALERS EVERYWHERE . . . CONSULT YOUR CLASSIFIED TELEPHONE BOOK

LUBRIPLATE THE MODERN LUBRICANT

not necessarily superior to the old machine.

I've seen cases where new equipment was installed and stood idle because the old equipment could handle all the necessary work. I've also seen old equipment scrapped and replaced with rebuilt machinery which turned out to be in worse shape than the originals. During the war I witnessed the installation of a vertical shaper that stood idle for six months because no one knew how to operate it efficiently.

I was employed at one time in a jobbing shop where the newest machine was over twenty years old. We consistently turned out finer work than our competitor who had all the latest equipment.

When the foreman can show management in black and white how he can reduce costs of operation or increase profits by installing new equipment, they can't afford to overlook his request. If the finances of the company are in bad shape, no figures in the world can induce the management to invest money in better or more machinery.

In most cases a new feed nut or a couple of new bronze bushings are all that is necessary to get a machine back in shape. The machine shop can always do a good job on the production equipment but when it comes to repairing their own machine tools, they shrug their shoulders and ask for new ones.

A committee consisting of the plant engineer, production foreman, machine shop foreman, purchasing agent, and plant manager should meet every three months and plan which machines or equipment should be replaced in the near future. An examination of the equipment should be made prior to the meeting and a report made giving recommendations. If the machine can be rebuilt, it would be folly to replace it with a new machine which might not prove satisfactory.

Frank J. Zarnowski
Rutherford, N. J.

•

G. K. CHESTERTON, the famous author, once said: "I believe in getting into hot water; it keeps you clean." The efficient foreman who risks getting into hot water with the Big Boss by recommending replacement of obsolete machines with new ones will not only keep his own conscience clean but may help the company clean up an unprofitable situation.

When you are confronted with the problem of reducing costs to meet competitive figures on production work, most often the only answer will be found in increasing the effi-

broaching will really save you money on those close tolerance high speed internal gears

HERE'S AN ACTUAL CASE:

The Old Production Line-Up	The Way It's Handled Now
1. Rough Broach	1. Rough Broach
2. Shape	2. Finish Broach
3. Shave	
Required Tolerance .0002"	Required Tolerance .0002"

EQUIPMENT USED:

1 Broaching Machine	4 Broaching Machines
18 Gear Shapers	
2 Gear Shaving Machines	

These are actual figures from a well known automotive gear plant which adopted the all-broaching procedure about 2 years ago. Since then savings have been spectacular.

Of course they don't use the garden variety of broaches. The savings and precision achieved would not be possible with ordinary tools.

This plant uses NALOY BROACHES each of which is good for 38,000 gears before it is retired. Naloy broaches have characteristics (and we can prove this) that the average broach shop just doesn't have the facilities to duplicate.

If you want Precision with maximum economy, send for a Red Ring Broach Engineer.

See the latest ideas in broaching and other Red Ring equipment in BOOTHS 601 AND 602 at the ASTE "COST CUTTING EXPOSITION" in Philadelphia, April 10-14

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ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

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Corners and edges of stainless steel cabinets on these automatic dishwashers must be carefully polished after welding. This manufacturer, not satisfied with results, switched to AP's No. 80 Jewelox Cloth X73. Now reports: *"This cloth is the best we've ever used!"*

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Fine chests and cabinets require a velvet-smooth finish. This prominent manufacturer tried AP's Bondite New Process Paper Belt — made like all Jewel Belts with AP's exclusive Velvet Joint that will never jump or scratch — got a 50% improvement in results over *all* previously used abrasives.

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Phenol plastic switch plates can be a tricky finishing problem. This manufacturer called in AP Engineers who recommended cool-running Silver Streak Belts. Result: Silver Streaks did 25% more work than other belts — eliminated spoilage — cost not a penny more.

Have *you* got a finishing problem? Whatever your requirements, chances are you, too, can do faster, better work — at lower cost — with AP Jewel Coated Abrasives. See your distributor or write us today!

Abrasive Products, Inc.

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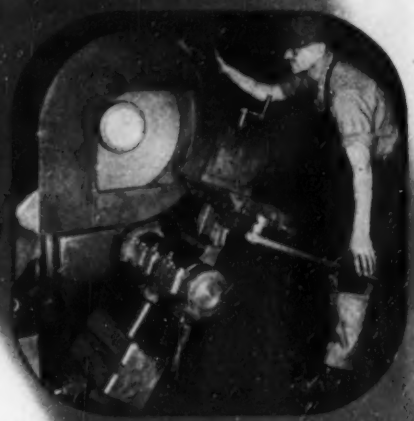
ciency of the machines on which men work. Cost-cutting devices should get top priority in management's attention to reducing costs in the shop, as well as increasing productivity. Recommendations for installing new time-saving equipment to raise output deserve the immediate study of management, no matter who makes them; whether it be the foremen or planning "commisison."

In the mechanical trades, improvements of machinery and equipment are constantly being made. Likewise, competition and the results of machinery market surveys frequently suggest variations in production, and it should be possible to effect changes in the shop to improve productive efficiency. In this connection, the wise selection of new equipment requires a knowledge of the fundamentals of good engineering design; it implies a thorough familiarity with different types and kinds of equipment and experience with its use. It is true that the foremen are in a good position to pinpoint the machines in their own departments that are inefficient and obsolete.

But selection of new machines falls into another category. The idea of a "planning commission" to crystallize the foremen's recommendations for replacement of obsolete equipment appears worthy of consideration. The committee can be the best judge of the equipment required. This committee, composed of the general manager, superintendent of production, head of the engineering department and foremen of the department involved, will best combine the necessary qualifications incident to wise selection and replacement of equipment.

There are advantages in utilizing the services of a "planning commission." It is not unusual to have a score or more of machinery and equipment companies competing when even a moderate amount of equipment is to be installed. It takes time to hear these many appeals, and considerable expertness to evaluate accurately their various claims. The "planning commission," when composed of representatives of engineering, production, and management, will be able to function intelligently in making recommendations as to what equipment to replace and the type of new equipment to install. Being representatives of varied fields they will probably be able to bring to bear upon specific problems of machine replacement experience gained throughout a wide range of industrial activity. They will probably have had opportunity to study equipment and machines in operation under varying conditions. The

Another Profitable Application of Hanna Cylinder Power

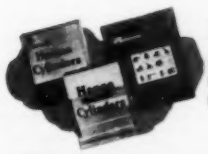


IN CONVERTING A DISK GRINDER FOR PRECISION FACE [illegible], the smooth, dependable power of a Hanna Hydraulic Cylinder and [illegible] arrangement was used to efficiently rapid-traverse the table up to ac[illegible] slow, adjustable, infinitely-variable feed for cutting and to rapid-traverse back. With the unusual tooling on this standard grinder, small brass, bronze, aluminum and magnesium valve parts can be produced at a fraction of the usual cost by eliminating a grinding and lathe operation.

There are 1001 applications of Hanna Cylinder Power throughout industry . . . to achieve nearly every push, pull, lift, press, clamp or control problem involved . . . for both standard and special machines and equipment.

Hanna Cylinders are used to advantage for faster, simpler, safer machine control and actuation . . . to replace manual effort and speed up production . . . to supply smooth, dependable *economical* power.

Standard model Hanna Cylinders are available for nearly every mounting requirement . . . for pressures up to 1500 p.s.i. . . . for pneumatic or hydraulic operation.



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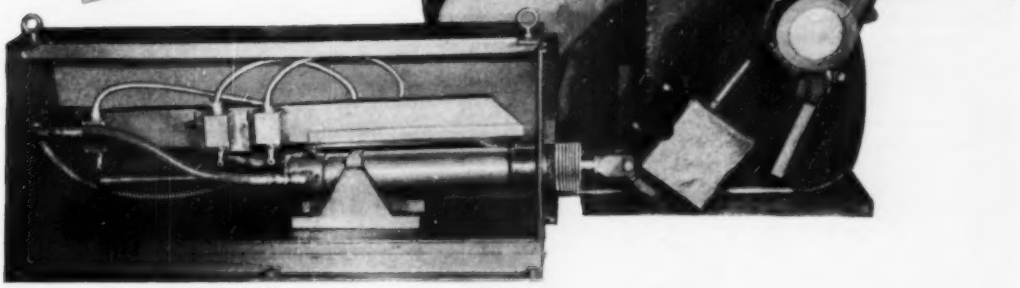
Hanna Hydraulic Cylinders....Cat. 233
Hanna Precision Valves.....Cat. 251



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Fills long awaited need for medium weight Drill Press
Sensitive drilling machine with 25" swing for high speed production, yet suitable for maintenance work. Variable speed drive—select exact speed for any size drill from 1/8" to 1"—self-locking, convenient speed control—no belts to change—tachometer provides accurate reading of spindle speeds. Powered with 1½ H.P. motor. Five spindle speed options, each with a 4 to 1 range from a low of 206—825 R.P.M., to a high of 540—2160 R.P.M., with 3 phase 60 cycle motor. Oil groove table accuracy maintained to .0007" in 6 inches—maximum spindle travel 8". Splined spindle and driving sleeve are ball bearing equipped for free floating action. Alloy steel spindle and quill precision machined and ground. Column diameter 4½". Machine weight 765 lbs. Chart shows proper speeds for different drill sizes.
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Sibley Model E-25. Coolant pump is the only extra.
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commission could act as a clearing house for the best equipment which has been evolved. When they are grounded in the principles of machine design and experienced in its operation, they are capable of expertly analyzing the requirement of the equipment needed for the particular shop. In this particular shop it may be that the best solution will combine machines from several competing concerns, and necessitate some original design to eliminate misfits, overlaps, or gaps in the layout wanted for increased production. This phase of the task calls for real ingenuity and intelligence on the part of the "planning commission" to meet the requirements of today's integrated and specialized manufacturing facilities needed to produce the unit most economically.

Harry Kaufman
Philadelphia, Pa.

•

Did Ed have something? No doubt he did, but whether he will get his ears knocked down or be praised for his alertness depends upon a number of things. Evidently, his step was out of the ordinary, and he was going directly to the Big Boss. Well, the Big Boss may resent things out of the ordinary and tell Ed to go through channels, or he may want the details at once, agreeing that something should be done about those old machines.

Possibly the Big Boss was responsible for those old lathes being retained on the job and resents anyone suggesting they are money losers. Result? Ed would be butting his head against a stone wall.

Persuading management to spend money for new equipment requires a high order of salesmanship in most cases, and while the plant men may recognize the deficiencies of the outmoded or worn out machine better than the Big Boss, few of them back up their request for new equipment with a carefully prepared set of figures substantiating their argument.

If the shop has a planning committee of some sort to consider suggestions, poorly prepared suggestions are much more liable to receive judicial consideration than if left to the Big Boss.

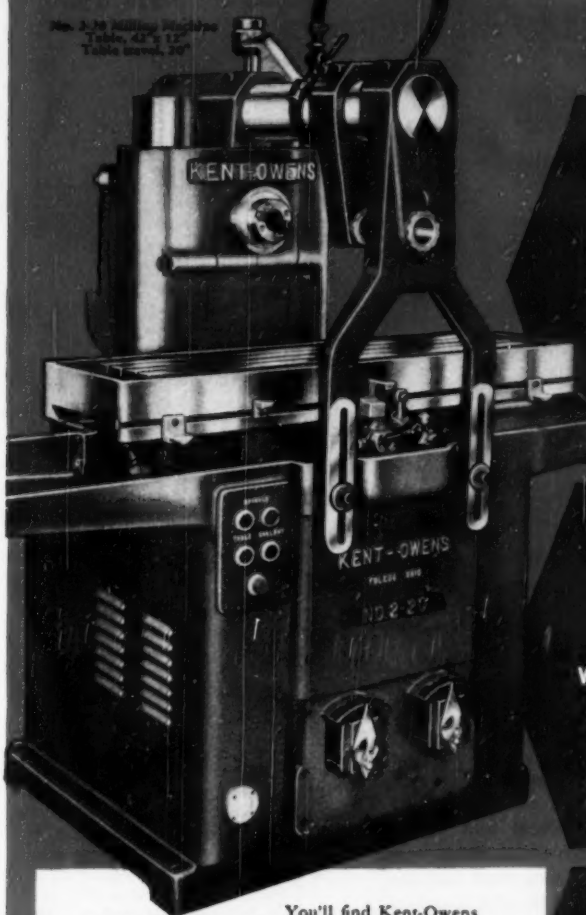
Ira A. Butcher
Piney River, Va.

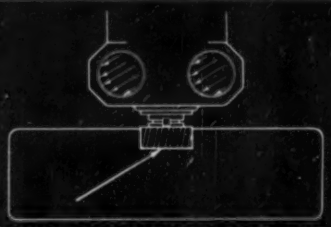
•

THE FIFTH WHEEL

Equipment inspection is one of the most important phases of controlling the cost of production. Too frequently the job is left up to the foreman

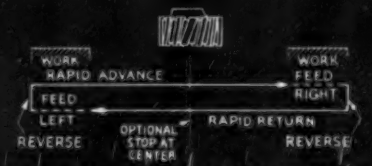
KENT-OWENS *Plus Features* Give You PLUS PRODUCTION!





TWIN POST HEAD MOUNTING

Head mounted on two cylindrical ground steel posts which carry spindle midway between them—an exclusive Kent-Owens feature! No overhang.



WIDE RANGE OF AUTOMATIC CYCLES

Hydraulic feed used on all Kent-Owens power feed machines. Wide range of automatic cycles available including intermittent milling, etc. Independent feed rate for both directions of table travel permits doing entirely different operations at opposite ends of table.

You'll find Kent-Owens Milling Machines the cost-cutting answer to a wide range of milling jobs! They're *rugged, simple, versatile* . . . with practical features that reduce machining time . . . save labor . . . and maintain high precision. Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with tooling and special machine requirements. Kent-Owens Machine Co., Toledo, Ohio.

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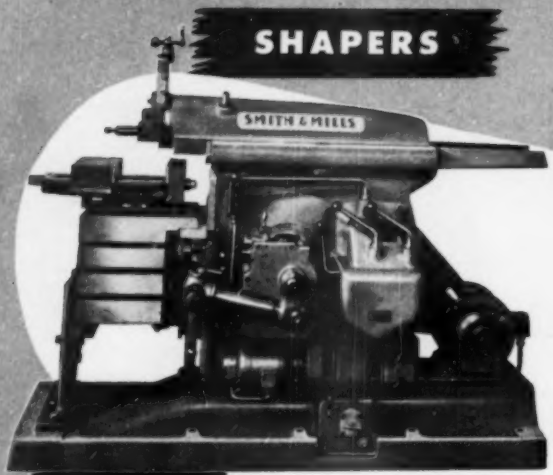
ONLY TWO GEAR CONTACTS . . . MOTOR TO CUTTER

Drive is unusually simple and direct, being taken from a standard foot mounted ball bearing motor at rear of machine. Wide range of spindle speeds by changing pick-off gears.

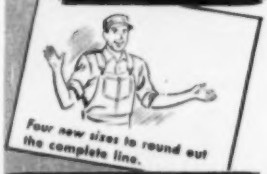
NEW VERSATILITY...

FOR SMITH & MILLS

SHAPERS



Added Sizes



Four new sizes to round out the complete line.

More Time-Saving Features

New, production-speeding advantages.

Greater Capacity

New Specials for shaping larger castings.

Added sizes, more money-saving advantages and greater job capacities now make Smith & Mills Shapers more versatile... give them sharply increased productivity.

Four new sizes, 20" and 24" Standard, and 14" and 36" Heavy Duty, have been added to round out the complete line.

New features cut setup and machining time sharply. Included are such advantages as horizontal and vertical power rapid traverse to the table; automatic tool lifter; tool head indexing unit; front hand feed, and automatic vertical feed to tool.

Two additional new models are now available for shaping larger castings. These are the 32" and 36" Specials, with greater capacity under the ram, and longer cross travel.

Write Dept. AM-3 for full details and your copy of catalog.

SMITH & MILLS SHAPERS, Inc.

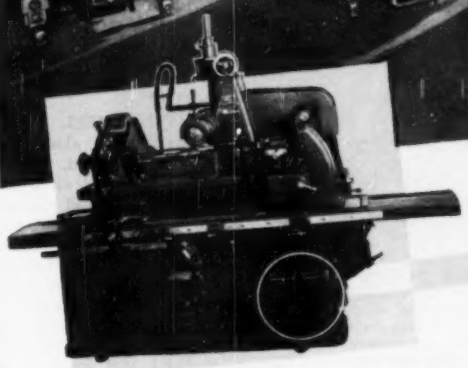
DIVISION OF HAMILTON THOMAS CORP., HAMILTON, OHIO

of each department who has been instructed that he must produce quantity of sufficient quality to get past the inspectors, of course, but QUANTITY is first and foremost. Since there is a check on the product for quality this will take care of itself. So merrily on the way goes the foreman straining every machine to the utmost, never giving a rest to a hot motor or a loose bearing. If the machine doesn't run at all, then call in the maintenance department but caution the workman not to spend too much time on the machine since it must be rushed back into production . . . all in order to get the order out at top speed for the Big Boss. And so it goes, equipment slowly goes to pot and production slowly slips off and the company slowly goes out of business.

I sincerely trust that all foremen won't come out for me with guns. There are many men who do try to look after their equipment. Many more think that they are doing a thorough job but have never been taught the importance of proper lubrication of machinery by controlled methods or the preventive maintenance which always needs to be carried on. No, they are not at fault. How could they know these things? After all, many of these men only a few years ago worked out in the plant as a machine worker and have never been trained in the proper thinking about equipment. If they can get along with fellow-workers and were good workers, they got the promotion to foreman and were left to their own resources. The company too often, does not think about proper foreman training. They may make a pretense of it by giving the foreman training on how to get along with his superiors and with his men, but never on how to use his equipment to the best advantage. So when equipment starts to slip, the company begins to find other means of controlling the life of the machine.

A foreman, if he is really up to date in his thinking, will not blow up at the suggestion of machine control. He will welcome the fact that someone else is going to take the rap later on when a machine fails to produce. He may, if he is one of the few men who know costs, see that the new method of operation is a logical step. It actually doesn't take anything away from his job for it now becomes more of a problem to arrange schedules to allow for machines that are down. Production must be kept up in spite of the missing machine so the foreman is called upon to use his knowledge of manpower spreading and this gradually builds him up to become a better or-

DESIGN LEADERSHIP



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SQUARE D's DESIGN LEADERSHIP is reflected in important features: Generous wiring space . . . simple contact change . . . easy coil removal . . . additional electrical interlocks . . . long life . . . NEMA standardization . . . simplified maintenance. These are features which add up to an ever-increasing preference for Square D motor starters.

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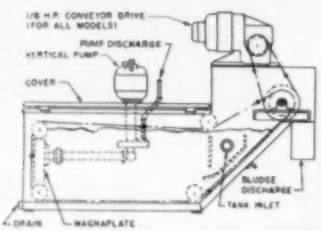
The HOFFMAN Magnaflo Separator

- **Models for machines requiring 20 to 100 g. p. m. flow rates**
- **Delivers sludge in relatively dry form for easy disposal**
- **Magnets completely submerged —effective 100% of time**
- **Minimum floor area—sets in old sump tank space**



Fully automatic operation of "Magnaflo" holds dirty coolant for settling out of solids. Then, coolant is drawn past Magnaplate which collects ferrous matter. Flights on drag chain conveyor scrape down plate and remove solids in near-dry state to sludge discharge.

At last—an inexpensive coolant clarification unit for individual machine tools, that eliminates sump cleaning. 75 to 90% of solids can be removed by the Hoffman "Magnaflo" principle of magnetic separation and settling out in the same tank. Needs no maintenance. 20 and 40 g. p. m. models are complete with pump and tank. Other sizes for 60, 80 and 100 g. p. m. capacity. Larger sizes built to your requirements. Write now for full details and actual case history data.

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211 LAMSON STREET, SYRACUSE 6, N. Y.
CANADIAN PLANT CANADIAN HOFFMAN MACHINERY CO. LTD. NEWMARKET, ONT.

ganizer and a better administrator.

So we have decided that machine inspection is a must. How should it be controlled? It should never be placed under an inspection department, whose duty is to inspect quality of product. This would be as troublesome as having inspection answerable to the foreman. Machine inspection and control of equipment maintenance should be under the supervision of the plant engineer. His duty is the upkeep of all buildings and equipment. Possibly his work may be sub-divided and the actual overseer is the machine shop foreman, but nevertheless his department knows ills of the machines.

There is no reason to have a separate department answering to the front office. The plant engineer can solve the problems that arise very nicely and work with the plant superintendent as to when and how machines will be overhauled. Both men are interested not only in production but also in the cost of that production.

A foreman working in this type of setup can easily help keep this equipment in good shape by working closely with the machine inspectors. Thus no reduction of foreman responsibility is taken. For he is still responsible for the machines but has help in finding the ills before the the machines break down completely.

Charles D. Townsend
Fort Wayne, Ind.

•

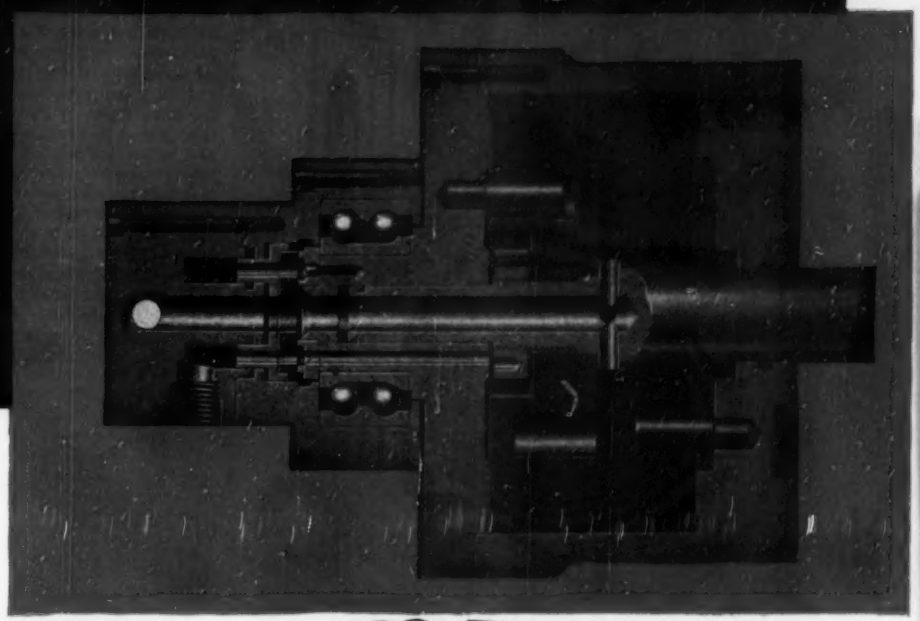
THE FIFTH WHEEL

As we progress further along the road to quality achievement, we see more visible the value of close inspections by competent and trained individuals. These men, on the watch for faulty parts, are also able to see why these parts are turned out. They may be the fault of some piece of equipment and it would be right in their line to have the duties of observing this as part of their job.

Not only could this method of double checking prevent mixups, but it would also speed changes requested due to some irregularity in the product or in the engineering of the part. Many times, tools are made for a job and when the actual work begins, the work has to be completely remade.

I don't think that the inspector should have the sayso over the foreman in charge, but he could surely work with him and help in the building, checking and offering of ideas that will accomplish the task. It is the responsibility of the personnel department, or the one doing the hiring of help, to select the proper one for this task. Nothing gets under a

AN IMPORTANT ADVANCE
TO MEET TODAY'S DEMAND
FOR SPEED IN MACHINING



THE CUSHMAN HIGH SPEED *Aluminum* AIR CYLINDERS

FOR POWER CHUCK OPERATION

Important NEW
COST CUTTING METHODS and EQUIPMENT will be demonstrated at the CUSHMAN EXHIBIT BOOTH 866 ASTE INDUSTRIAL EXPOSITION PHILADELPHIA April 10-14, 1950

Especially developed for advanced high speed machine tool applications... these cylinders will operate with a minimum or no loss of air on spindles up to 7000 r. p. m.

Aluminum alloy forged cylinder bodies finished with lapped bores... cylinders statically balanced after assembly, no vibration, low flywheel effect.

Available for use with Cushman or other chucks in 3¼" to 12" sizes. Send for Bulletin.

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mechanic's skin more than a snoop who is full of suggestions but lacks the proper background qualifications to back up his voice. An inspector has to really understand the workings of psychology and know how to approach these suggestions so that they are made in a manner that does not represent an "I told you so" attitude.

Also of advantage on this issue is the fellow's ability to get around to different departments during the process of his job. Not only can he act as an inspector, but by proper methods can bring the different departments into closer understanding. Al doesn't have time to run around and keep his department ticking at the same time. With an assistant of this caliber, he could keep up to date and follow the work from the blueprint to the shipping crate, and still maintain his high order of efficiency.

In regard to cost of this type of insurance, it is just this: We pay a lot of money for insurance these days and it pays off when the time comes. This cost will easily be absorbed through production increase and time saved. The inspector, in charge of a job, should have the authority to stop that job if he sees it falling down on specifications, and if able to detect the cause, either mechanical or human, he would be responsible to the foreman for its correction. It wouldn't take many spoiled parts to pay this fellow's salary over and over again.

Jack Bell
Bakersfield, Calif.

•

EXCUSE ME, PLEASE

That a foreman must be firm is unquestionable. However his firmness should not lead him into an unreasonable or an unpleasant manner.

In giving orders he should use plain and explicit language that can be understood by anyone and his talk should be given with a certain amount of dignity.

No one should ever be antagonized. Firmness can and should be accompanied by courtesy.

A foreman necessarily must contact workmen of practically all kinds of dispositions, and we have been told that to get satisfactory results a foreman must show to each individual a disposition that is at least as rough as the individual worker.

In over 25 years of experience in five different shops where each differed from the others in class of work, I have not found that to be so in trying to get the best results, except that the thoroughness and carefulness of wording did need to

Baker 4 Station Automatic Transfer Machine

Increases Production— Reduces Handling

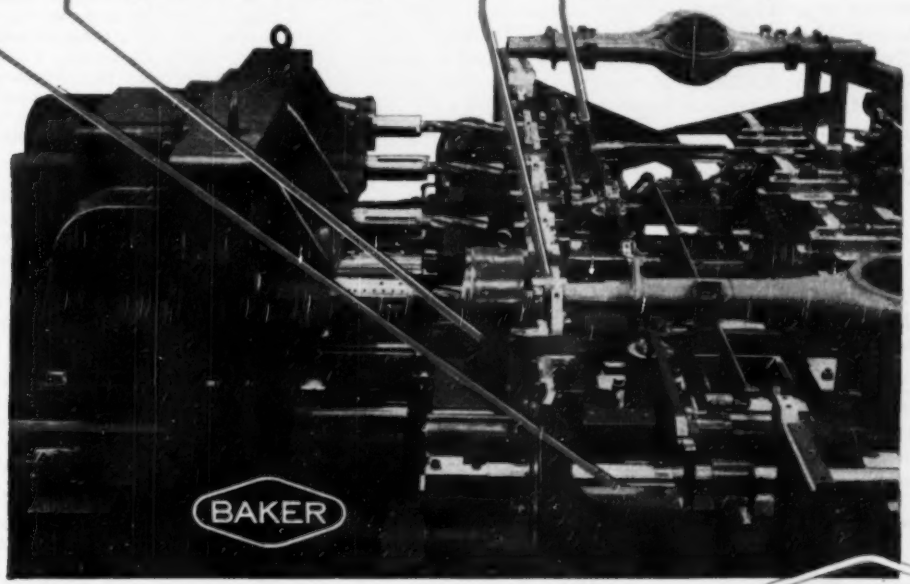
For End Operations on Axle Housings

1 Flexibility provided for handling housings from 60" to 92" in length with bore diameters ranging from 1½" to 2 7/16".

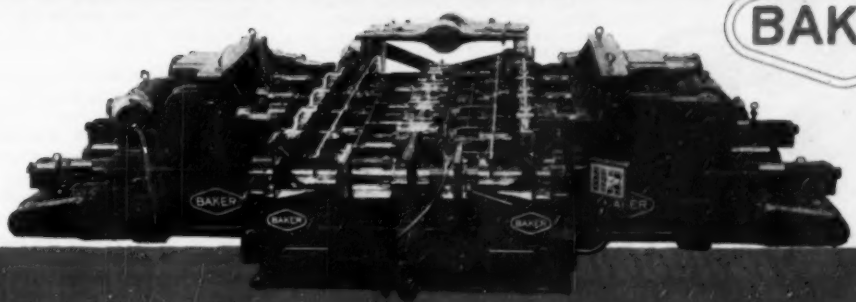
2 Spindle ends carrying Coredrills at first station piloted through live bushings. Total depth of coredrilling divided into four passes.

3 Parts automatically clamped at each station by hydraulic pressure which turns screw that actuates jaws. Hydraulic pressure always on, assuring positive clamp at all times.

4 Housings raised on index rails and indexed to next station hydraulically. Automatic unloading.



BAKER



BAKER BROTHERS, Inc., Toledo, Ohio

Drilling, Tapping, Keyseating and Contour Grinding Machines

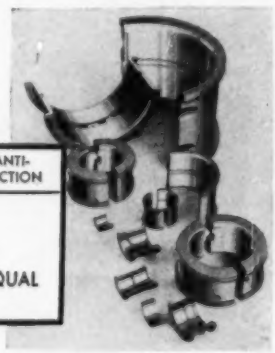
when low cost is important

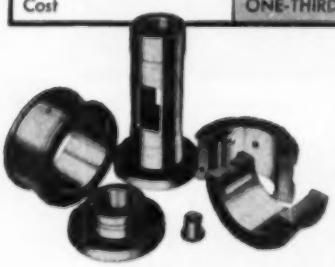
Investigate JOHNSON SLEEVE BEARINGS

YOU may be looking for a means of reducing the cost of parts and assembly time on equipment you manufacture. Here is an example of how Johnson Bronze can help. The sleeve bearing illustrated above was produced to replace an antifriction bearing in an important automotive application. It delivers equal or better performance yet costs *only one-third* as much. Multiply this saving by the thousands of units in which it is installed and you will quickly see the importance of the substitution.

check these important facts

	JOHNSON SLEEVE TYPE	ANTI-FRICTION
Running Friction	LOWER	
Load Carrying Capacity	GREATER	
Resistance to Pounding	GREATER	
Precision	EQUAL	EQUAL
Cost	ONE-THIRD	





SLEEVE BEARINGS by Johnson Bronze are designed by engineers of long practical experience and years of metallurgical and mechanical research. Numerous leading manufacturers consult our specialists before designing or redesigning mechanical equipment. Such firms benefit by high bearing performance and low unit cost. You, too, are invited to write or to consult personally on bearing requirements with these Johnson Bronze Engineers.

Johnson Bronze
SLEEVE BEARING HEADQUARTERS
515 SOUTH MILL STREET • NEW CASTLE, PA.

differ somewhat for each individual worker, making it necessary for the foreman to explain details to whatever extent might be required to make sure of a thorough understanding. Some workmen who were keen would require but little explanation where others needed every last detail of procedure thoroughly explained.

H. B. Martin
Watervliet, N. Y.

•

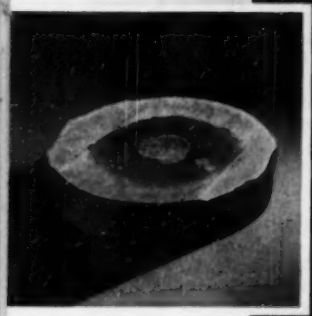
On one of my first jobs, the foreman was from the old school. Every order was a bark, he was constantly shouting and hooting. One day he barked at me for a minor infraction and I walked over to the locker room to dress and go home. He followed and apologized. He explained that his help consisted mostly of non-skilled aliens and the only way he could get them to understand him was to shout and bellow. He had been doing it for so many years that he couldn't break himself of the habit. I stayed on the job and eventually became accustomed to his barking. I noticed that the other men were also immune to his shouting and it had no effect on them. They did no more work for him than they did for his soft-spoken successor.

When a "pusher" is brought into a shop where the men are not accustomed to rough treatment it affects the morale. They will develop a dislike for him and contrive methods to irritate or aggravate him. If the men are under pressure, a tough foreman can cause a boiling point and display of violent tempers.

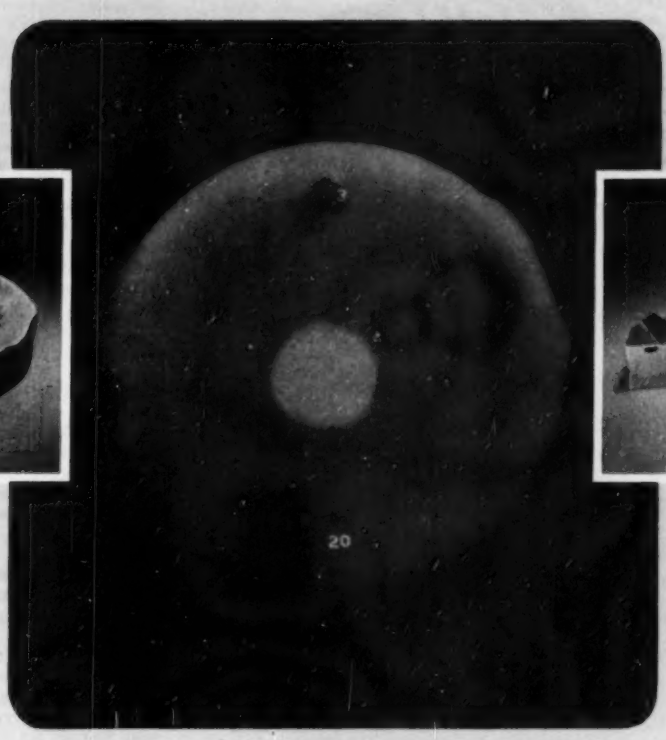
If the workers try to take advantage of the supervisor because he is agreeable, or courteous, he should quickly bring them in line by letting them know that he can be stern when it is necessary. I worked with an engineer one time who was quiet and courteous in the office but rough and grouchy in the shop. He explained that the men had more respect for him when he was sour-faced and criticized their work. His theory was that if the men constantly tried to please him they would be doing their best work.

This system might be all right in some shops but in general, a smile or word of appreciation brings the same results. Some workers can't "stomach" a supervisor that throws his weight around and have an unhappy life with the company.

During the war, many of the rough leaders were placed in the background to prevent upsetting new employees not accustomed to this treatment. I have attended union meetings where members criticized a



Aluminum alloy casting 2¼ x 1¼" for aircraft accessory part.



Section reveals hole detected by radiography.

Radiograph which revealed defect in casting.

Minutes of Radiography saved hours of machining

AFTER machining, this aluminum alloy casting was to be an important part in an aircraft accessory, vital to high-altitude flying. The finished part was needed quickly by the customer. Design specifications demanded high quality.

This was no time to wait for machining to disclose any defects. There was too much to lose —setup time, machining time, take-down time, as well as the reputation of the foundry.

Radiography saved all that. In a few minutes it revealed a defect that caused rejection of the rough casting at the foundry. Other castings, proved sound by radiography, were sent to the customer.

Cases like this show how more and more foundries are able to release only sound castings. Perhaps even more important, radiography is showing how to make consistently sound castings, by picturing the internal effects of changes in gating, venting, chilling, pouring temperature, and other variables.

Ask your x-ray dealer to explain how radiography can help you increase yield and cut costs.

EASTMAN KODAK COMPANY
X-Ray Division, Rochester 4, New York

Radiography . . .

another important function of photography

Kodak
TRADE-MARK

HERE'S HOW...

PRODUCTION WAS INCREASED 40%

costly lab treated taps produced 15,000 threaded holes per tap

HY-PRO ENGINEERING cut tap costs and increased production to 21,000

PART: Pressed steel tubular nut.

PROBLEM: A leading special products manufacturer was tapping with a 5/16 – 18 spiral point tap to a depth of 3/4" full thread in tough, stringy steel. To average 15,000 holes per tap, many required lapping to size and all were specially surface treated. A costly, time-consuming process for the user.

Then they called in a Hy-Pro Engineer.

HY-PRO SOLUTION: He recommended a Hy-Pro quality controlled 5/16 – 18 spiral point tap with an exclusive Hy-Pro surface treatment that provides longer wear and proper lubrication. Production now consistently runs 21,000 threaded holes per Hy-Pro tap — *and* they are used without modification.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.

Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS

HY-PRO TOOL CO.

NEW BEDFORD, MASSACHUSETTS

A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

particular supervisor's manner of distributing work or handling the men. The union officials notified the management of the complaints against this man, and steps were taken to bring him in line.

The officers of an organization cannot expect their subordinates or representatives to employ courteous methods if they themselves do not practice what they preach. Someone once said, "If the managers of business would show the same respect to their employees that they display to their customers, there would be more harmony."

Frank J. Zarnowski
Rutherford, N. J.

•

The bosses as—from the small one on up to the president—can show considerable courtesy toward employees without any letdown of control. In fact I think the executive who practices courtesy with business shows a greater strength of character than the high hat, bully or the I-am-boss-around-here type. Remember this doesn't mean that an "Emily Post" air of etiquette type of boss is called for. A man, no matter how high he goes, can be his decent self if he does possess the highest authority over the individual in any business. The men under you are keen to judge and ferret out the type of man you act up as to them.

I never have seen a case where courtesy led to a breakdown in morale or plant discipline. Courtesy can go hand in hand with firmness. To be firm don't mean tough either.

The real tough hard boiled boss has caused a lot of resentment among his men and that goes for the foremen under the big boss too.

Now if we have some freshie who can't stand courtesy from our higher authority men, the thing to do is warn the man and if he continues any practice of advantage traceable to courteous fair dealing from any higher up, the thing to do is get rid of him as he is a great liability to any fair deal shop. I believe we should judge the result of courtesy by the reaction to it, and by no means permit any individual conduct of an employee to change our methods in dealing with the majority of the boys or girls. The plant is not like a jail, you don't have to keep transgressors on the payroll.

This Round Table topic brings to mind the story of the early Astors. Going to Philadelphia one time they found all hotels filled. A courteous hotel clerk gave up his room to them. This courtesy impressed the Astors so much that when they built the Waldorf-Astoria they sent for this

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Specify **POPE Series P-HF100 High Frequency Motorized Spindles:**

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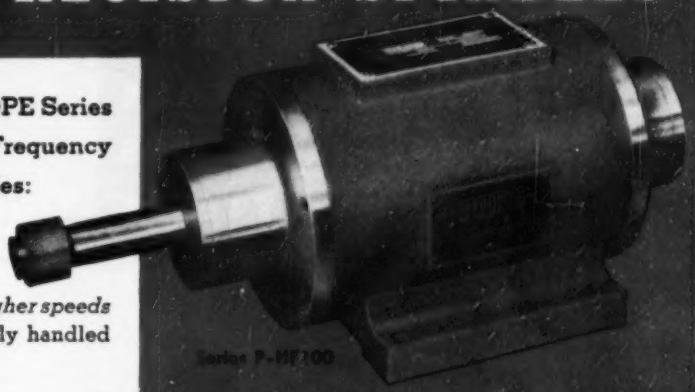
—when *more efficient* internal grinder spindles are wanted.

—when a *more compact* spindle package is desired.



Series P-HF100

POPE High Frequency, Series P-HF100 Internal Grinder Spindles are regularly furnished in speeds from 5400 to 54,000 R.P.M.

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P-5681

POPE High Frequency Direct Motorized Cartridge Type Spindle, with 1 HP motor at 7200, 10,800, 14,400 and 21,600 RPM, using 240 and 360 cycle current in combination with a two-pole, four-pole motor.

P-693

High Frequency 16,600 RPM totally enclosed fan cooled 1 HP motorized Spindle, over-all length 18⅜", barrel dia. 3", barrel length 9".

P-1932

High Frequency 18,000 RPM totally enclosed, fan cooled ½ HP motor Spindle arranged for vertical operation with the grinding wheel or tool at the upper end. Length 15⅛", barrel dia. 2½", barrel length 7⅛". Pope sealed-in lubrication.

P-5552

POPE Heavy Duty, High Frequency, Direct Motorized, Cartridge Type Milling Spindle. 14,400 RPM, 15 HP totally enclosed, water cooled motor, 240 cycles, 3 phase. Oil mist lubrication.

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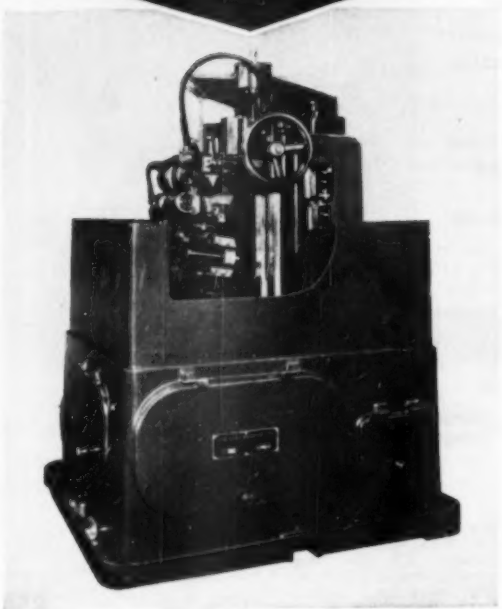
The LEES-BRADNER Model 12-S 13" x 16" GEAR HOBBING MACHINE

Easy to OPERATE

Easy to CHANGE



CAPACITY—13" diameter up to 16" of face and 4 diametral pitch in steel, in one cut.

FEATURES—The Lees-Bradner patented hob in-out mechanism; rapid traverse differential; and, if desired, the lead differential mechanism is available.

ONE MAN CAN HANDLE SEVERAL MACHINES!

Write for Bulletin 61-A

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

young man and on arrival they presented him with the management of that famous hotel as a reward for his courtesy. What better example do we need than this one?

Henry Rasmussen
Niagara Falls, N. Y.

•

EXCUSE ME, PLEASE

Most people, whether they are factory workers or office employees, like a pleasant greeting as they start work each day. This greeting doesn't have to be one of the soft soap variety or one that pries into the private life of the worker from the time he had left the job to the time of his return. A casual "good-morning" will work wonders in morale building. However, don't lose sight of the fact that it can't be done only to a few. It must be carried to each and every person under your supervision. To neglect one person is like driving a knife into the worker. It sets up a mental fear in the mind of the employee that the boss doesn't like him anymore. Maybe the boss is planning to get rid of me, thinks the worker. And so the actions of the boss all day long are analyzed with this warped point of view. The employee finally does fail to accomplish good work, he fails to think clearly and his quiet homelife is erupted into a hubbub.

Good manners never lost a day's work. The foreman that handles his men on the Golden Rule policy usually reaps many gains. If he needs help in a tight pinch, he gets loyal support from his workers.

Again it should be stressed that this policy of good manners must not be made a method to obtain information about the worker to be used against him at some later date. Nor should it be carried so far as to see each and every worker privately each morning. A foreman has to get around to his workers during the early part of the day and he has, at that time, his opportunity to say a pleasant word to each one.

Remember that it is always possible to catch more flies with sugar than it is with vinegar. Men like to be considered human. Maybe the present governmental agencies believe men are machines so that they can collect when they wear out. But deep in the heart of every person is that individualistic attitude which, if given a chance to grow, prefers to do the thinking for himself. True, many go with the masses. That is and always will be the case.

Those companies who have found the secret of successful personnel relationship have discovered you must educate your workers in busi-

May we EXPLODE an old theory on machining ?

We refer to the idea that a water-soluble oil should be used as the cutting fluid in automatic screw machines. A few years ago we might have agreed with that—but not now! There is *one*—and one only—which we would now recommend for automatics. That is ANTISEP All-Purpose Base. Solutions of that modern concentrate are being used all over industry in automatics, because it is proving more than satisfactory from every angle—cooling ability, safety, finish and speed.

The reason is that Antisep A.P. Base isn't just another water-soluble cutting oil. It has established an entirely new concept in machining. Here is a base oil with high fatty content, anti-welding characteristics, high film strength and excellent lubricating qualities. It may be used for 90% of all machining jobs, and it costs, in solution, less than 7 cents a gallon!

May we cite you authentic instances of where and how Antisep Base is out-performing former types of cutting fluids in automatics? We believe you'll then agree that we've busted an old tradition wide open. E. F. Houghton & Co., 303 W. Lehigh Avenue, Phila. 33, Pa.

Read what

ANTISEP A.P. BASE

is doing for others:

In 40 days a wheel manufacturer saved $341.60 on oil alone, with better tool life, no rust, no bearing wear, no parts too hot to handle.

•

Surface speeds up to 340 FPM were attained on an automatic machining large bearing races of 52100 steel. "Only oil having sufficient lubricating qualities," says the manufacturer.

•

Cost of machining air hose coupler reduced from 46¢ to less than 10¢ per gal. for Antisep solution. Work is cooler and cleaner.

•

A collet maker estimates Antisep Base on one automatic saved him $350 last year.

•

Tool life on forming tools has increased 100%, says a clamp maker. Production upped 15% since switching to Antisep Base.

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ness, you must apply courtesy in your employer-employee relationships and you must properly take care of the worker's welfare.

Charles D. Townsend
Fort Wayne, Ind.

NEW BOOKS

FLUID PRESSURE MECHANISMS—*By H. G. Conway, M.A., Published by the Pitman Publishing Corp., 2 W. 45th St., New York, N.Y. 218 pages, Price $5.*

Intended for engineers who are familiar with detail design, but looking for new principles, this book is devoted entirely to the latter. Covering hydraulic, pneumatic, and compressed-gas systems of high, medium, and sometimes low pressures, it is written for the man who wants to know "how."

The seventeen chapters are divided into two sections. Chapters One through Ten discuss mechanisms; eleven through seventeen, pressure systems, including remote control, variable speed, sequence, servo, and electric control. An appendix provides a discussion of early hydraulic mechanisms, plus an index. Diagrams, which total 175, contribute greatly to a rapid understanding of the text. Applications are discussed for land vehicles, aircraft, and machine-tools.

If you feel that the recent advances in fluid pressure operation make it important to your product or manufacturing process, this book should be part of your study.

•

MACHINERY'S HANDBOOK (*Fourteenth Edition*). *1911 pages, 4½ x 7 in. Published by the Industrial Press, 148 Lafayette St., New York 13, N. Y. Price, $7.*

The always-good *Machinery's Handbook* has been enriched by taking note of recent developments in standards that interest the designer and the shop man. Among these improvements are:

Twenty-four pages on the Unified Screw Thread System adopted in 1949 by the United States, Great Britain and Canada.

The latest standards of the National Electrical Manufacturers Association on motors, and mounting dimensions are given, together with application data on motor drives.

The section on worm gearing has been revised and simplified solutions of problems in worm gearing are supplied.

Roller-sprocket data are brought up to date. Current standard com-

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positions of steels are listed. Carbide-tool sharpening is described specifically.

And, in addition, the editors have compiled other new pages, tables or diagrams of value to the designer and builder of machinery and mechanical devices.

•

PUNCHES AND DIES. FOURTH EDITION. *By Frank A. Stanley. 583 pages. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. Price $4.75.*

For 30 years die designers and die makers have used and benefited from earlier editions of this well-known standard text. For the new fourth edition, Mr. Stanley has rearranged the material into eight handy sections comprising 26 chapters. Some of these chapters are entirely new; others have been expanded with new data and illustrations. Typical of the additions are layouts for piercing, notching and other dies with cemented-carbide inserts. Altogether, the book covers up-to-date practice and contains many valuable drawings, tables, and rules for tools required for the various presswork operations currently in use.

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LES ACIER FINS ET SPECIAUX FRANCAIS (HANDBOOK OF FRENCH SPECIAL STEELS). *Third Edition. 300 pages. Published by S.P.A.S.—12, rue de Madrid, Paris, France. Price 770 French francs.*

This book covers French fine and special steels and information on the producers thereof. Purpose of the book is to facilitate technical and commercial contacts between French producers and consumers in that country or other countries. Information is given on how to fit the steel to the application and how to order material economically and efficiently.

•

MECHANICAL ENGINEERING PRACTICE *(4th Edition) — By Chas. F. Shoop and George L. Tuve, Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N.Y. 513 pages, Price $4.50.*

When a textbook and laboratory manual of experimental engineering achieves success worthy of publishing four editions, it speaks best for itself. In this revision, the first since 1941, the authors have brought all of the material up to date. New chap-

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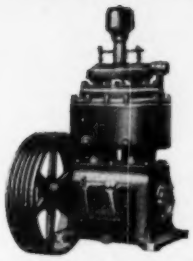

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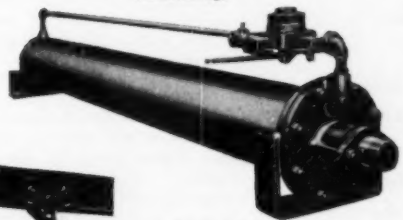

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ters, tables, and illustrations have been added to provide the student or experimenter with the developments, the knowledge, that resulted from war and postwar efforts.

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This book is well worth investigating as a college text for engineering students, or as a manual and review for the practicing engineer.

•

MECHANICAL WORLD ELECTRICAL YEAR BOOK 1950—*Published by Emmott & Co., Ltd., 31 King St., West, Manchester 3, England. 360 pages. 4x6. Price 3 shillings.*

This 43rd annual edition of a popular British handbook has undergone considerable revision and includes an entirely new text on electric welding, covering the widest field of equipment and application, and providing useful information on the subject. Extensive revision has also been accorded to the pages dealing with meters and measuring instruments, and with electrical measurements and testing.

•

TASCHENBUCH FUR DEN MACHINENBAU (HANDBOOK FOR MACHINE BUILDERS). *Edited by Prof. Heinrich Dubbel, Tenth Edition. Two volumes, 1527 pages, 2900 illustrations. Published by Springer-Verlag, Berlin. Available in the United States from Stechert-Hafner, Inc., 31 East 10th St., New York 3, N. Y. Price, $7.15.*

This handbook, printed in German, has achieved a sale of 205,000 copies since 1914 and an excellent reputation for coverage of subject matter commonly found in mechanical engineer's handbooks.

The first volume of Dubbel's handbook deals with mathematics, mechanics, thermodynamics, fuels, materials, machine elements. The second volume covers boilers, reciprocating machines (steam engines, compressors, pumps), rotating machines (water and steam turbines, centrifugal pumps and turbo compressors), piping, cranes, conveyors, machine tools. So far as required, data on appropriate German standards are included.

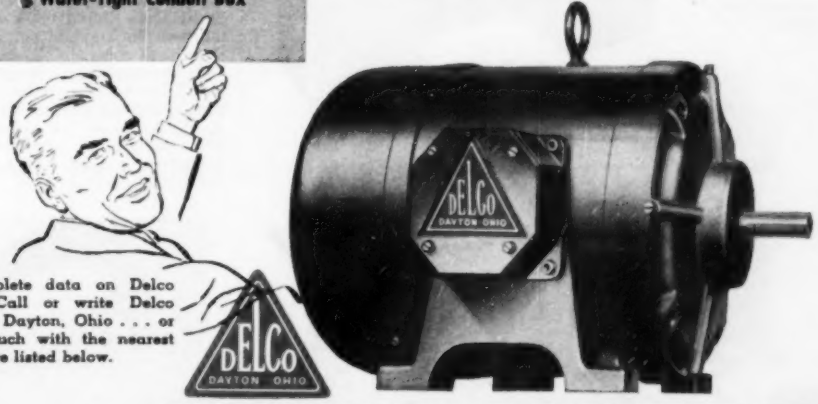
On more and more spec sheets . . .

Delco preferred!

- Positioned Bearings
- Delcote Coil Insulation
- Corrosive-Resistant Cast Iron Frame
- Positive Lubrication
- Dynamically Balanced Rotor and Shaft Assembly
- Water-Tight Conduit Box

Two words that mean top motor performance

You see the words "DELCO PREFERRED" on more and more spec sheets. That's because Delco motors are built the way production men want motors built. They are rugged, dependable, and made of the finest materials. A few of the performance extras that Delco motors give you are listed here:



Get complete data on Delco motors. Call or write Delco Products, Dayton, Ohio . . . or get in touch with the nearest sales office listed below.

DELCO
DAYTON OHIO

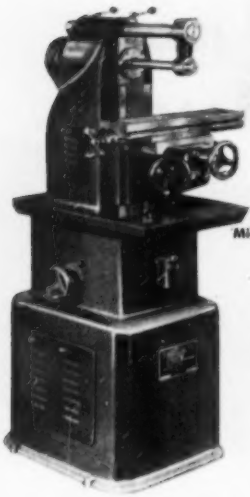
DELCO MOTORS

DELCO PRODUCTS, DIVISION OF GENERAL MOTORS CORPORATION, DAYTON, OHIO

SALES OFFICES: CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HARTFORD, CONN.

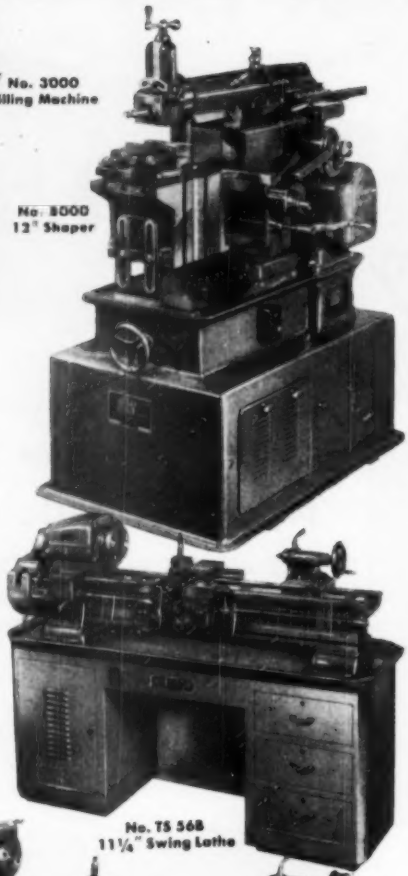
SHELDON

Precision Machine Tools



No. 3000
Milling Machine

No. 8000
12" Shaper

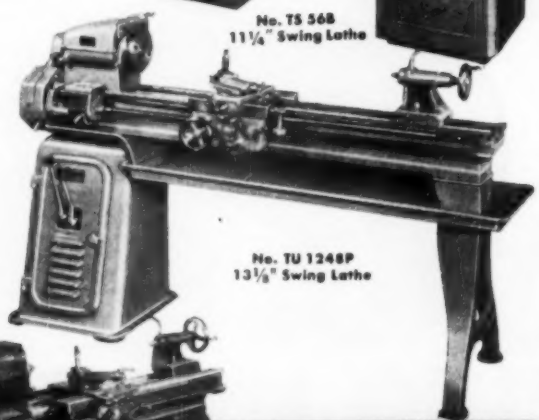


Sheldon Precision Tools are engineered to meet today's demand for moderate priced machine tools that can work to closest tolerances. They are of capacities to meet the everyday demands of the average tool room or shop. They are compact in design and easy to operate. They have the built-in stamina for continuous production operation.

Built by modern methods in a specially tooled, modern machine tool plant, they cost less than other machine tools of comparable quality.

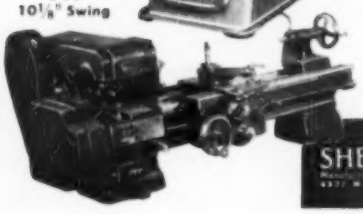
No. TS 568
11¼" Swing Lathe

Write for catalog.



No. TU 1248P
13⅛" Swing Lathe

L 44
10⅛" Swing



SHELDON MACHINE CO. Inc
4257 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U.S.A.

Names in the News

(Continued from page 135)

Berton E. Rogers has been named works manager, Winchester Repeating Arms Co. Div., Olin Industries, Inc., at New Haven, Conn. He relinquishes his post as works manager of the Olin plant in East Alton, Ill. During the war Mr. Rogers was general supt. of the Olin-operated St. Louis Ordnance Plant. Prior to joining Olin he was chief inspector of the Brunswick-Balke-Callender Co., Muskegon, Mich. **John Wesley Hanes,** former under-secretary of the Treasury, has been elected a vice president and director of Olin, and appointed to the executive committee.

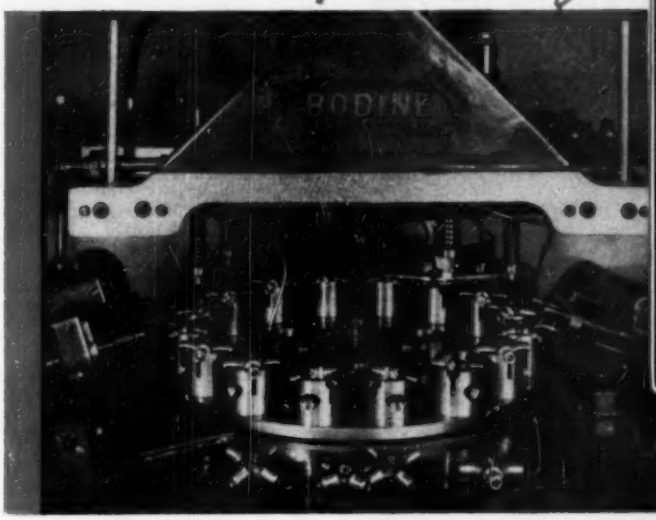
Guy A. Baker has been named vice president in charge of manufacturing, Duriron Co., Inc., Dayton, Ohio. For several years he has been assistant to the president and secretary of Duriron. **R. Merton Shields** has been named secretary. He was manager of the Dayton district sales.

John W. Wilkinson has been named general sales manager, McKiernan-Terry Corp., Harrison, N. J. For the past ten years he has been with Pomona Pump Div., Fairbanks, Morse & Co., as field project engineer.

D. L. Mills, president, Whirl-A-Way Motors, Inc., Tipp City, Ohio, has been named eastern regional sales manager of the Motor Div., A. O. Smith Corp., Milwaukee, with headquarters in Dayton. A. O. Smith Corp. has contracted with Whirl-A-Way to manufacture Smithway fractional horsepower motors to specification, serving the eastern region of the U. S., while the western region will continue to be served by the company's present Los Angeles motor manufacturing plant.

D. L. Mills

To Manufacturers of



AUTOMOTIVE *small parts*
AIRCRAFT *small parts*
ELECTRICAL *components*
RADIO *and* TV *components*
ORDNANCE *small parts*
ACCESSORIES — *instruments, relays, gages, etc.*
HARDWARE — *components or other items requiring high speed, repetitive production*

Bodine machines are so fast, so accurate and so easy to operate that their production rate outstrips that of other machinery in the average plant.

For those who can use Bodines . . . they offer a definite competitive advantage in high speed, low cost production.

Bodine engineers will gladly study your specific requirements for automatic, multiple spindle operations which may include Milling, Drilling, Tapping, Screw Inserting and assembly in one machine . . . or any combinations of the above.

Working stations are located around an automatic indexing horizontal dial. Spindles will operate from a vertical, horizontal, diagonal or inverted position. Feed and ejection are either wholly automatic or manual, depending upon the nature of the work.

Send us your blueprints . . . or sample parts . . . for recommendations. Detailed Bulletin on request.

THE
Bodine
CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

One plant using a battery of 16 Bodines reports savings of up to $200 per day, per machine over former method.

VERSA-TILE
Heavy Duty Gage Blocks
Webber 5in
Webber 1-2-3
Assembled in a few seconds
Extra large gaging surface
Sturdy, rigid build-ups
Low in cost
Details upon request
CARBLOX CARBIDE
ANGLE BLOCKS
STANDARD STEEL BLOCKS
H. D BLOCKS and FIXTURES
Webber
GAGE COMPANY
12901 TRISKETT RD.,
CLEVELAND 11, OHIO
LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS
LATEST PRICE LIST
Webber Gage Blocks
STANDARD STEEL BLOCKS B Accuracy .000008"
84B-84 block set $235.00
43B-43 block set 150.00
38B-38 block set 155.00
STANDARD CARBIDE (CARBLOX) B Accuracy .000008"
82B-82 block set $1,175.00
33B-33 block set 495.00
Carblox Wear Blocks .100" set of 2 with case 21.50
For price list on Standard Steel and Carbide "A" blocks (accuracy = .000004") or special blocks, write or wire.
ANGLE GAGE BLOCKS
16A-16 blocks $450.00
HEAVY DUTY GAGE BLOCKS AND FIXTURES Accuracy .000005"
36 H.D. $450.00
24 H.D. 385.00
WEBBER GAGE COMPANY
12901 Triskett Road • Cleveland 11, Ohio

E. K. Brown has been named director of research, Torrington Co., Torrington, Conn. He is succeeded as chief engineer of the Needle Bearings Div. by **B. T. Virtue.**

Greswold Van Dyke has been named executive director, Stainless Steel Producers—American Iron & Steel Institute, New York.

Joseph S. Scheuermann has resigned as vice president and sales manager of Cameron Machine Co., Brooklyn. Until his successor is named, sales will be under the direct supervision of **P. J. Lathrop,** president. **Eugene Ward,** service manager, has been named assistant sales manager, his former duties being assumed by **John Dain,** supervisor of demonstrators.

G. L. Revell, sales engineer for Lincoln Electric Co., has been named sales manager of Cal-Metals, Inc., Los Angeles.

Joseph A. Martino, president of National Lead Co., New York, has been elected to the board of Allegheny Ludlum Steel Corp., Pittsburgh.

George H. Hodapp has been elected president, Heller Brothers Co., Newark, N. J. **James G. Henry, Jr.,** was elected vice president and secretary, **Miss Anna W. Ibach,** treasurer, and **Eugene M. Steenburgh,** assistant secretary.

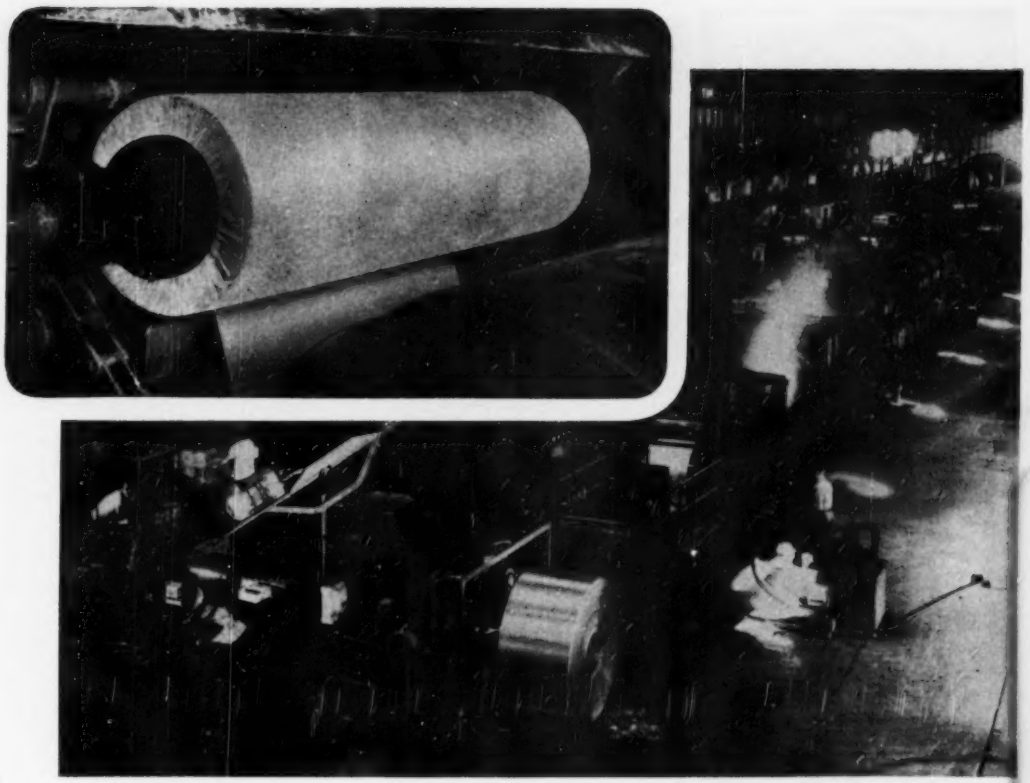
Edward G. Fenton has been named supt. of Alan Wood Steel Co.'s new $9 million hot rolled strip mill at Conshohocken, Pa. He had been supt. of the company's Schuylkill Iron Works since 1936.

Robert N. Hendrickson has been named vice president in charge of sales engineering, and **Frank A. Dobbe** has been named vice president in charge of sales, Huck Mfg. Co., Detroit.

James R. Logan has been named vice president in charge of manufacturing and engineering, United States Air Conditioning Corp., Minneapolis. **Merrill L. Benson** has been named manager, Coils & Coil Products Div.

C. H. Marshall, who represented Baldwin Testing Equipment Dept. in New York, has been transferred to headquarters of Baldwin Locomotive Works, Philadelphia. Succeeding him in New York is **H. G. Graff,** who was testing equipment sales engineer in Boston.

Edwin F. Blair has been elected a director of Packard Motor Car Co., Detroit, filling the vacancy caused by retirement of **George T. Christopher.** He is a member of the law firm of Blair & Ogden, New York.



Strip comes clean at *1500 feet per minute* with OSBORN power driven brushes

ON the continuous scrubbing operation above, 6 Osborn Heli-Master* Brushes are mechanically cleaning strip steel at speeds of over 1500 feet per minute. This vital mill operation is removing all traces of rolling oil from the strip prior to electrolytic tin plating.

Heli-Master Brushes can be supplied with the correct material to do tough cleaning jobs well. In the job illustrated, the operating conditions include high pressure hot sprays. The brushes give around-the-clock dependable performance. They are helping assure continuous, uninterrupted production schedules by maintaining consistent high quality of finished products.

If you have a continuous strip cleaning, sheet scrubbing, scale removing, bonderizing or conveyor cleaning problem, it is likely that it can now be done easier, faster and at lower cost with new improved Osborn brushing techniques. Why not consult your Osborn representative. Call or write—

THE OSBORN MANUFACTURING COMPANY
Dept. 257 5401 Hamilton Avenue • Cleveland 14, Ohio
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Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY • POWER DRIVEN BRUSHES • PAINT BRUSHES • MAINTENANCE BRUSHES

SPRING IS SURE HERE!
IN
GARRETT
SPRING WASHERS

CONTROLLED TENSION

Garrett Spring Washers are made to hold right . . . stay tight. Exclusive Controlled Tension built into each washer to provide exact holding power for longer time.

PRECISION SIZES

Each washer is made to meet exacting size specifications—I. D., O. D., height and material thickness is scientifically controlled to Nth degree accuracy.

RIGIDLY INSPECTED

Garrett's laboratories and quality control tests assure highest quality in finished products. Size, shape, and finish are all carefully checked to meet rigid specifications.

100 VARIETIES

Belleville, bevel, wave and many other types are all included in the more than 100 varieties of types and sizes available in Garrett's standard line. We welcome your request. Send in your specifications. We can probably save you plenty in die costs. Write for our booklet. Let us prove it.

GARRETT'S MANUFACTURE A COMPLETE LINE OF LOCK WASHERS . FLAT WASHERS . STAMPINGS . HOSE CLAMPS . SPRINGS

GEORGE K. GARRETT CO., Inc.
PHILADELPHIA 34, PA.

GARRETT
OF
PHILADELPHIA

Carter C. Higgins

Hollis I. Conner

Carter C. Higgins has been elected president and general manager of Worcester Pressed Steel Co., Worcester, Mass. **John W. Higgins,** president from 1912 to 1950, became chairman and retained his position as treasurer. **Maynard F. Carter,** comptroller, replaced Carter C. Higgins as secretary. **Trusten P. Draper,** vice president and general manager since 1938, has retired. Other directors are **Owen H. Wenning,** sales manager, and **J. Walter Gulliksen,** general supt. The new president has been regional chairman and national vice president of the Pressed Metal Institute. He is chairman and treasurer of Livingstone Engineering Co., Worcester.

Malcolm W. Valentine has been named supt. of inspection and quality control, rough and machined castings, Hunt-Spiller Mfg. Corp., Boston.

William Dubilier, founder and technical director of Cornell-Dubilier Electric Corp., South Plainfield, N. J., and also president of Koldweld Corp., has been awarded the Chevalier Cross of the French Legion of Honor, as an appreciation of Mr. Dubilier's contribution to the development of the French and international electrical industry and also for his humanitarian activities.

F. H. Clark has been named sales manager for the Standard Control Div., Westinghouse Electric Corp. at Beaver, Pa. **Frank E. Bodine** has been named assistant central station manager for the Pacific Coast district of Westinghouse, with headquarters in San Francisco. He was former Pacific Coast manager of maintenance sales.

Lewis R. Mellem has been named commercial engineer of the General Electric range and water heater division, Bridgeport, Conn. He had been acting in that capacity since February, 1949.

J. F. B. Jackson has been named director of research to the recently formed Research & Development Div., British Steel Founders' Assn.

Hollis I. Conner has been named assistant manager, Export Div., Hyster Co., Portland, Ore. Three new district managers of industrial truck sales have also been named: **Donald R. Shaffer,** for southeastern Canada, eastern Michigan, northern Ohio and southwestern New York; **John F. Wright,** for Alaska, western Canada, Washington, Oregon and parts of Montana and Idaho; **Karl T. Barr,** for the Hawaiian Islands and several western states, including California, Arizona, Nevada and Utah.

C. L. Stocker has assumed sales and engineering responsibilities for Lincoln Electric Co., Cleveland, in the San Francisco area, with offices in Emeryville. **M. F. Yale** and **T. Nichol** have joined the welding engineering staff at Emeryville. **A. L. Patnik** has been given responsibility for Lincoln welding engineering in the Seattle district.

Bernard B. Winter, engineering director of the Rootes Group, London, has been elected chairman of the Council of the Motor Industry Research Assn.

J. Sterling Davis has been elected treasurer and a director of National Electric Products Corp., Pittsburgh.

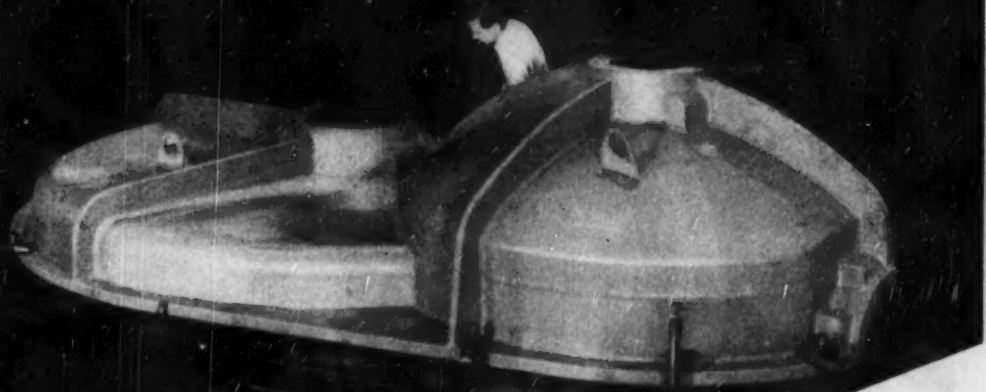
Erb Gurney has been named manager of sales forgings, castings, and ordnance, Bethlehem Steel Co., Bethlehem, Pa.

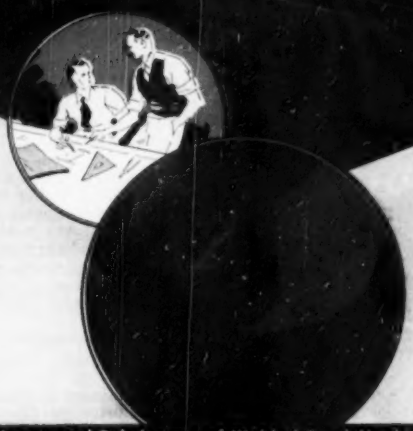
Carl A. Day has been named head of manufacturing at Bausch & Lomb Optical Co., Rochester, N. Y.

D. M. Berges has been named chief engineer, Pesco Products Div., Borg-Warner Corp., Chicago. He has served as chief engineer of Pesco's electrical section since 1943.

Gus Gran and **Eino Hill** have been named representatives in the Detroit and Chicago offices, respectively, of New Britain-Gridley Div. of New Britain Machine Co., New Britain, Conn. Mr. Gran had been with Colonial Broach in Detroit for 16 years.

Steel-Weld FABRICATION





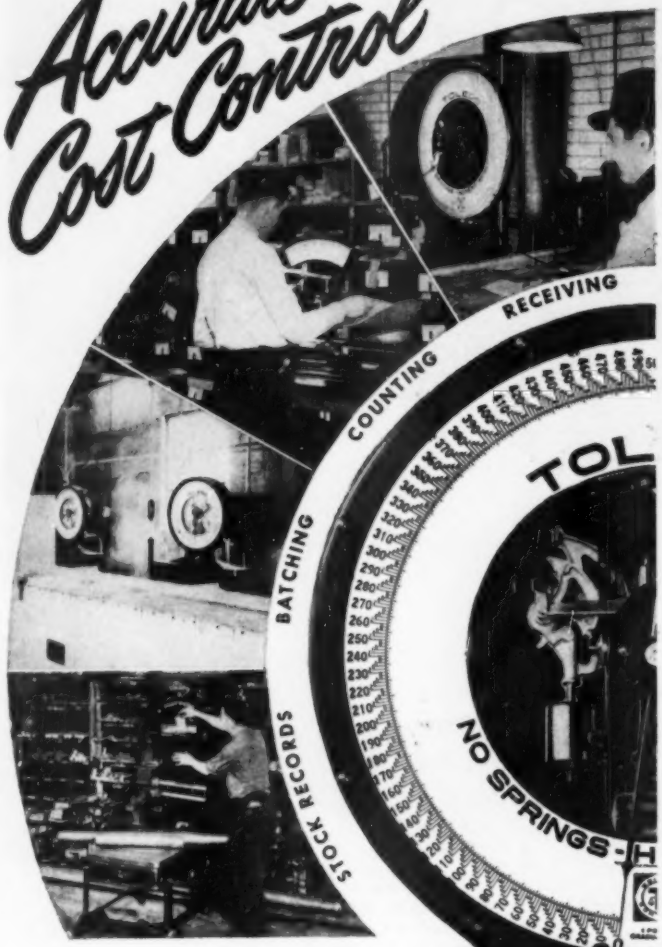
Steel-Weld Fabrication of irregular shapes, such as the gear housing cover illustrated above, is a true test of design ability, craftsmanship and production facilities. Regardless of what your requirements may be — no matter what size, shape or weight — you will find in the Mahon organization an unusual source for welded steel in any form . . . a source with complete production and machining facilities, backed by a staff of competent design engineers and highly skilled workmen from whom you may expect a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY
DETROIT 11, MICHIGAN

Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

MAHON

TOLEDO—the Heart of *Accurate Cost Control*



More and more under today's conditions Toledos give you the assurance of close cost control so vitally needed for profitable operations.

Toledos fit the needs of the most modern plant layout . . . they're *speedy, accurate, dependable* . . . providing vital cost-data on materials and products every step of the way . . . in receiving, shipping and production. Whether it's weighing, checking, testing, counting, batching or force-measuring—there's a Toledo to help you *control costs and quality!* Factory-trained Toledo service men near you in 200 cities of United States and Canada. Toledo Scale Company, Toledo 1 , Ohio.

SEND FOR WEIGHT CONTROL BULLETIN 3030

STOP ERRORS

Toledo Printweigh Scales provide printed weight records . . . assure you that the accurate indication of the Toledo dial will reach your accounting records without chance of human error.

TOLEDO
HEADQUARTERS FOR SCALES

John H. Smith

John H. Smith has been elected president, General Electric X-Ray Corp., Milwaukee, succeeding **John H. Clough,** who becomes chairman. Mr. Smith was formerly executive vice president. Before joining G-E X-Ray in 1947 as assistant to the president, Mr. Smith was assistant sales manager of General Cable Corp., New York; procurement manager of Cramp Ship Building Co., Philadelphia; and assistant to the general manager, Schlage Lock Co., San Francisco.

Ferdinand Schmitz has resigned as vice president of Pacific Car & Foundry Co., Seattle, to accept a similar position with Seattle Steel Co. and Inland Empire Steel Co., a subsidiary of Seattle Steel.

Howard Vogel, chief engineer, Champion Spark Plug Co., Toledo, has been named to the newly created post of director of engineering, with **Roy Paton** as his assistant. Mr. Paton has been in charge of engineering production.

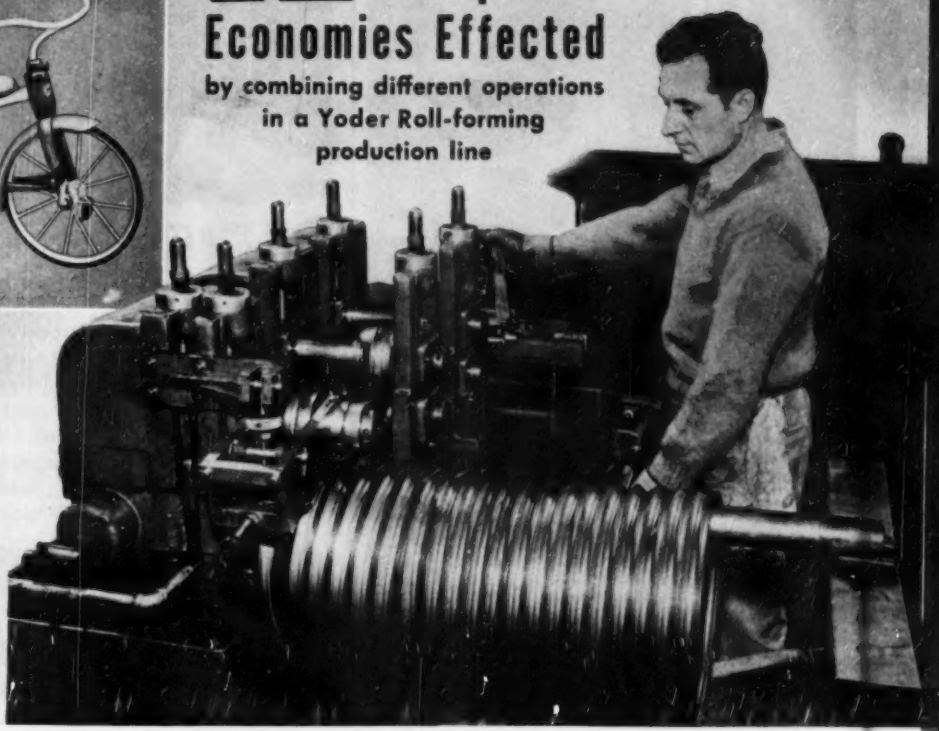
Harry Oldham has been named foundry supt. of Hunt-Spiller Mfg. Corp., Boston, a subsidiary of A. S. Campbell Co., East Boston.

J. J. Rozner has been named works manager, Aetna Ball & Roller Bearing Co., Chicago. He has been chief engineer for the past ten years, a post he will continue to hold together with the supervision, as works manager, of all manufacturing operations.

A. C. Thompson, formerly works manager of the Bartlett Hayward plant of Koppers Co., Inc., Pittsburgh, has been named production manager, Metal Products Div. He will be responsible for production, methods, incentives, and services at both Bartlett Hayward and the American Hammered Piston Ring plants of the division, both in Baltimore. **Nick Kay** has been named general supt. of the division's machine shops. **E. A. Franke** has been named general supt. of the foundries.

*12 Examples of Economies Effected

by combining different operations in a Yoder Roll-forming production line



*NO. 6

Flat Strip Continuously formed and Coiled into Wheel Rims

The forming of wheel rims and rings for many purposes, can be done continuously, in a single passage through a Yoder cold roll forming machine equipped with a suitable coiling device. The coils may simultaneously be cut to length, coming out as individual rings, of almost any thickness, profile design, and diameter.

Many other operations can be performed in Yoder production lines, such as combining different metals, inserting paper, felt or rubber, injecting adhesives or viscous fluids, embossing, notching, perforating, seam or spot welding, etc.

Flat rolled metal up to ¼" thick, of almost any width, can be cold formed into structurals, mouldings, panels, tubes and other hollow sections.

Production upwards of 30,000 feet per day is obtainable, usually with only one operator, employing flat strip in coils or cut lengths.

This invests Cold Roll-Forming with infinite possibilities for drastic cost reductions in the mass production of structurals, mouldings and other components for buildings of all types, automobiles and other vehicles, furniture and fixtures, household appliances, toys, bicycles, etc.

Yoder engineers are at your service in designing roll forming production lines to meet individual needs. Literature, recommendations and estimates for the asking.

THE YODER COMPANY

5519 Walworth Avenue • Cleveland 2, Ohio

Complete Production Lines

- ★ **COLD-ROLL-FORMING and auxiliary machinery**
- ★ **GANG SLITTING LINES for Coils and Sheets**
- ★ **PIPE and TUBE MILLS–cold forming and welding**

ENGINEERING YODER MANUFACTURING

IT'S A

Mac-it®

PRONOUNCED "MACK-IT"

Mac-it Hollow Pipe Plugs — for accuracy, safety, uniformity and strength.

BETTER, FASTER SERVICE WITH THIS *COMPLETE* MAC-IT LINE!

Because many standard types of Mac-its are stocked throughout the country for quick delivery, and because specials can be engineered to your own specifications, you'll find it pays to investigate Mac-its *first.*

Mac-it's 35 years' experience in the manufacture of heat-treated, alloy steel screws is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada. Write for new catalog today!

Other Mac-it products include:

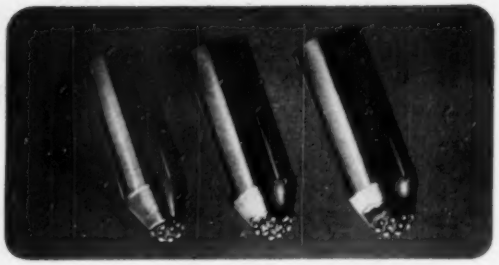
Hollow Lock Screws	Socket Screw Keys
Socket Head Cap Screws	Square Head Set Screws
Hollow Set Screws	Hexagon Head Cap Screws
Stripper Bolts	. . . and many others

Manufactured Nationally Since 1912 by

STRONG, CARLISLE & HAMMOND COMPANY

Cleveland 13, Ohio

Manufactured by MAC-IT PARTS COMPANY, Limerick, Pa.

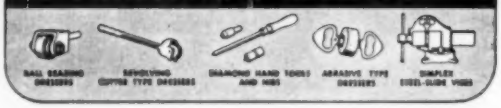


new "DI" nibs save up to 25% of wheel dressing costs

Desmond's DI (diamond-impregnated) nibs and hand tools save substantially where extreme precision and dressing of contours are not involved. They cost less than single diamond dressers: small inexpensive diamonds are permanently imbedded in cemented tungsten carbide matrix. Every particle is used fully—no waste. No danger of diamonds popping loose: you save replacement costs and remounting downtime.

Desmond

DRESSERS & CUTTERS



the only complete line of grinding wheel dressing tools

DI Nibs are easy to order: They come in three tip sizes, for wheel sizes shown below:

TIP NO.	WHEEL DIA.	WHEEL FACE
DI-1	up to 20"	up to 1½"
DI-2	up to 26"	up to 2½"
DI-3	up to 36"	up to 8"

These three standard size tips may be mounted in all standard type shanks and hand tools shown in the "Desmond Diamond Tool Reference Guide." Your Desmond distributor can meet your exact requirements. Call him . . . The Desmond-Stephan Mfg. Co., Urbana, Ohio

Desmond selling aids

Get your copy of the DESMOND DIAMOND TOOL Reference Guide

Another MILFORD Money Saving MEMO

MILFORD FLEXIBLE REZISTOR MEANS LONGER BLADE LIFE

Depend on the MILFORD Flexible REZISTOR to deliver its full cutting life without premature breakage — to last up to ten times longer than standard steel blades. The Flexible REZISTOR is shatter-proof — no flying fragments to injure the operator. Exclusive MILFORD Easy-Starting Teeth start the cut on the first stroke at any angle — prevent jamming by keeping the cut free and clear of chips. Teeth are as hard as those of any power blade; the back is tough and flexible. See your nearby MILFORD Distributor about Flexible REZISTORS today!

This booklet tells you more. Get your copy, and literature on the complete line, from your Milford Distributor today. Or, write direct to the factory — TODAY.

THE HENRY G. THOMPSON & SON CO.
Saw Specialists Exclusively For Over 70 Years
NEW HAVEN 5, CONNECTICUT, U.S.A.

Profile and Band Saw Blades — MILFORD — Rezistor & Duplex Hack Saw Blades

SOLD THROUGH SELECT INDUSTRIAL DISTRIBUTORS

these automatic surface finishing machines

UTILIZE EXTRA HOLDING POWER of MAGNA-LOCK Magnetic Chucks

developed by Clair Manufacturing Co., Inc., of Olean, New York, for finishing back edges of knife blades, pocket knife spring backs, plier sections, large open-end wrenches and similar items.

Load of various plier sections in place on a MAGNA-LOCK Chuck. A full load consists of 88 sections.

HOW WORK IS HELD

by MAGNA-LOCK Chucks. Clair Surface Finishing Machines take profitable advantage of the extra holding power of any MAGNA-LOCK Chuck. 40" wide, 8" to 14" deep. Rough glaze to mirror finishes are obtainable.

SAVES

Again MAGNA-LOCK Chucks eliminate need for the usual costly holding fixtures, save hours of set-up time. MAGNA-LOCK'S extra holding power permits greater finishing accuracy on even smallest pieces. And because its top plate is magnetic to the extreme edges, more pieces can be loaded at a time.

Get all the FACTS and you'll get MAGNA-LOCK — first to increase your machine's productivity. Write today to Dept. AM-30.

Do you want information on the new MAGNA-VISE for holding any material on your chucks? Write today for details!

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It's one thing to get a gear cut exactly to your specifications . . . and another to get it *on time*. To be sure of satisfaction *both* ways, there's only one safe thing to do: specify Grant gears. For, whether you order by 'phone, telegraph or letter, Grant will have just the gear you want on its way in a matter of hours.

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Grant has all types.
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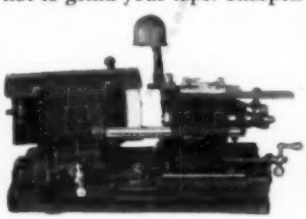
Grant FOR GEARS

Sharpen Up!

Blake TAP GRINDERS . . . increase Your Tap "Life Expectancy"

Now you can get full production from your taps and reduce breakage due to dull chamfers. Inexpensive Blake Tap Grinders accurately, economically, and *quickly* grind uniform chamfers on 2 to 10 fluted right or left hand taps. Only a few seconds are required to insert taps for grinding and no special training is necessary for operating. Here is the easy, sure way to increase your tap "life expectancy" and save many $$.

Remember, if you grind a drill, you can't afford not to grind your taps! Sharpen Up — (With a Blake Tap Grinder, of course).



Write for Bulletin 549A which tells about "Modern Tap Sharpening"

See us at the April A.S.T.E. Show — Booth 919

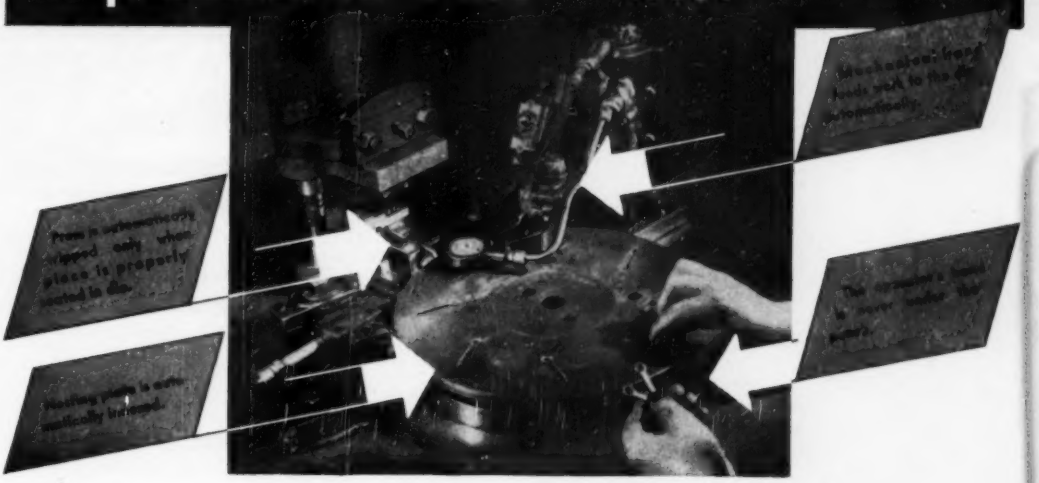
EDWARD Blake COMPANY

437 Cherry St., West Newton 65, MASSACHUSETTS

Block Diamond Precision Drill Grinders . . . Blake Tap Chamfer Grinders . . . Blake Flute Grinders . . . Waltham Cutter Sharpeners . . . Waltham Thread Milling Machines . . . American Tool Holders . . . Surface Finish Standards.

Here it is!

The V & O FEED-O-MATIC Press Feeder that increases punch press production 50 to 200% *with Safety!*


Mechanical hand feeds work to the die automatically.
Press is automatically tripped only when piece is properly seated in die.
Nesting plate is automatically indexed.

Users will tell you: When the V & O Feed-O-Matic takes the place of manual feeding for secondary die operations—punch press production increases 50 to 200%!

What's more, the V & O Feed-O-Matic reduces operator fatigue by automatically tripping the press. The operator simply—and with safety—places each piece into the automatically-indexed nesting plate, which conveys the blank to a micro-switch-equipped mechanical hand that transfers it to the die.

The V & O Feed-O-Matic increases die life, too. First, by placing work in the die with undeviating accuracy, wear on dies is minimized; second, by not tripping the press unless the part is in register, costly shut-downs, caused by damage to dies and presses, are averted.

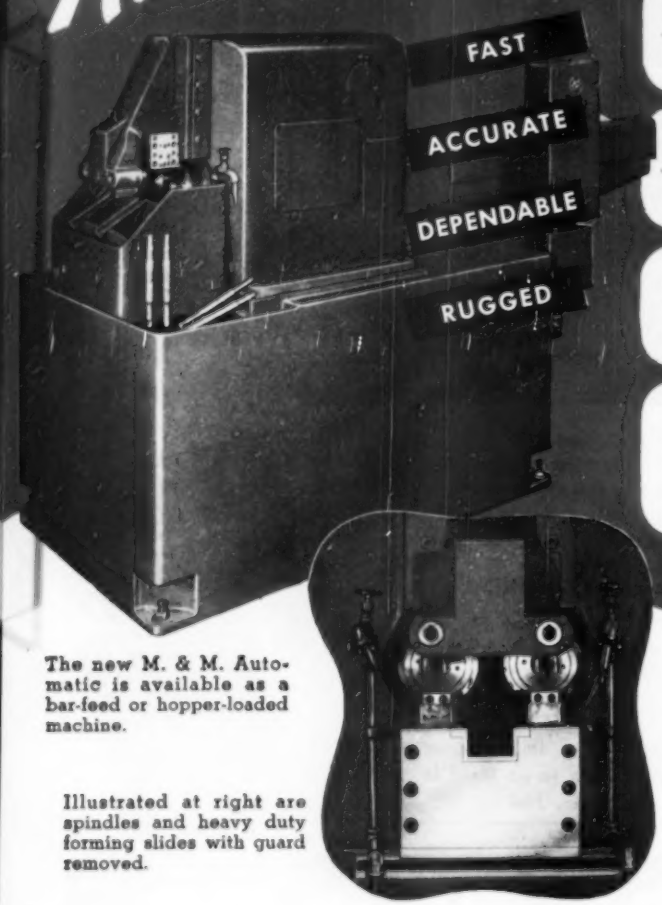
The V & O Feed-O-Matic can be applied to any make of press . . . requires no special dies . . . and can be set-up for new work in an hour or less.

FREE BOOKLET
Write, today, for your copy of the illustrated Feed-O-Matic booklet, which gives you full details, including specifications.

See the V & O Feed-O-Matic Punch Press Feeder in Action at the A. S. T. E. Industrial Cost-Cutting Exposition to be Held in Philadelphia April 10-14 — Booth No. 764

the V&O PRESS CO.
DIVISION OF ROCKWELL MANUFACTURING CO.
. . . Hudson, New York

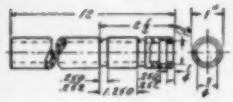
The New Motch & Merryweather Automatic



The new M. & M. Automatic is available as a bar-feed or hopper-loaded machine.

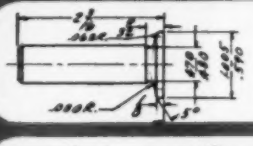
Illustrated at right are spindles and heavy duty forming slides with guard removed.

STUDY THESE TYPICAL JOBS

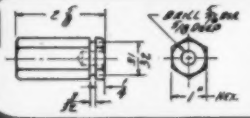


Operation: Form grooves, chamfer O. D., face and form internal groove.
Material: Seamless tubing—mild steel ⅛" wall.
Production: 1100 pcs/hr. @ 100% eff.

Operation: Form snap ring grooves, grease groove, chamfer and drill.
Material: AISI-1015.
Production: 720 pcs/hr. @ 100% eff.

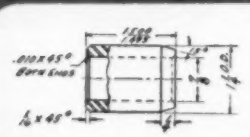


Operation: Face head, form back of head and neck.
Material: SAE 5120.
Production: 720 pcs/hr. @ 100% eff.



Operation: Form chamfer, groove, drill and cut off.
Material: Aluminum F.M.
Production: 680 pcs/hr. @ 100% eff.

Operation: Form diameter, groove, chamfer and cut off.
Material: Aluminum F.M.
Production: 510 pcs/hr. @ 100% eff.



Operation: Form chamfer both ends O. D. Break edges I. D. and cut off.
Material: Seamless tubing—SAE 1020.
Production: 600 pcs/hr. @ 100 eff.

The drawings above can only hint at the possibilities of the new, proven Motch & Merryweather Automatic. Study them closely, compare with your own requirements, and then

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describing your needs.

Manufactured by

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- ***For chrome-moly steels*** (1% Cr., ½% Mo.) used in power piping ... *80LE.*
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- ***For repair welding Grade C castings*** and steels of similar composition... *P&H#7.*
- ***Comparable to SAE 8630 steel***...excellent heat-treating and flame-hardening characteristics... *90LH#2.*
- ***For welding high hardenable steels*** without preheat such as re-rolled rail stock... *P&H#12.*
- ***For aircraft and similar steels*** . . . has wide range of properties under heat treatments... *P&H#21.*

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HOW MUCH DO YOU KNOW ABOUT

Alert and Saleswise the Man Who Scores High on This Metalworking Quiz

Answers at bottom of this page. Score 10 for each correct answer. If your score is less than 100, be sure to read how you can know *all* the answers next time questions like these come up about your biggest 1950 market.

		TRUE	FALSE
1.	There are now over 19,000 metalworking plants with 21 or more workers each.	☐	☐
2.	Metalworking now employs almost 4.5 million workers.	☐	☐
3.	The Southern States have been slowest of all areas in modernizing their metalworking production shops.	☐	☐
4.	The amount of over-age and obsolete machinery and equipment in metalworking production shops is greater now than it was in 1945.	☐	☐
5.	Over 25% of all machine tools are now owned by the U. S. Government.	☐	☐
6.	Metalworking's machine tools are relatively more modern than its metal-forming equipment.	☐	☐
7.	Among Metalworking's 15 manufacturing divisions, aircraft manufacturers have the lowest, automobile manufacturers the highest, percentage of machine tools over 10 years of age.	☐	☐
8.	Of Metalworking's 15 manufacturing divisions, Fabricated Metal Products Manufacturers have the most workers and production machines.	☐	☐
9.	Maintenance shops in the non-metalworking industries have been very active in the purchase of new machinery and equipment.	☐	☐
10.	Of all metalworking magazines *American Machinist* offers you the most readers and the most readers with top buying power.	☐	☐

ANSWERS: 1. True. There are now 19,499 plants with over 21 workers each. 2. False. Metalworking now employs over 5,600,000 people. 3. False. Machine tools in southern metalworking plants have more than doubled since 1945. 4. True. 42% of metalworking production equipment is now over 10 years old, compared to 37% in 1945. 5. False. The government now owns 13% of our machine tools. 6. True. 55% of metal-forming equipment is over 10 years old, compared to 43% of machine tools. 7. True. 16% of aircraft manufacturers machine tools are over 10 years old, 56% are over 10 years old in automotive plants. 8. True. They employ 1,222,894 workers, have 799,278 major production machines in 6,963 plants of over 21 workers each. 9. False. Over 60% of equipment in these shops is over 10 years old. 10. True. *American Machinist's* 28,000 *all-paid* subscribers outnumber those to any other metalworking magazine by almost 9,000. Subscribers among corporate officials, department managers, and engineers are *more than double* the subscribers with similar management titles to any other magazine edited for Metalworking.

YOUR BIGGEST INDUSTRIAL MARKET?

Not everything, for sure. Nobody does. Metalworking is simply too big and too active. But *more facts are available to you now than ever before*... and they are as near to you as your nearest *American Machinist* representative.

Do you need his help? The quiz on the opposite page will give you a clue. The answers to any of these questions you *don't* know... and to thousands of others directly geared to helping you sell more effectively in 1950's metalworking markets... are in his hands *right now*. So get in touch with him *soon*... and ask him to bring you all the facts and figures he has for you in the 96 pages of...

The Mid-Century Inventory of Metalworking Production Equipment
and 1949 Census of Metalworking Plants

Here... *and nowhere else*... is the information you need in determining where your biggest 1950 sales potentials lie. Here are the *facts* on the number of plants and employees in each of Metalworking's 15 manufacturing divisions and 25 major production areas. Here are complete statistics on the *number and age* of 155 major types of production equipment operating in each of these manufacturing divisions and areas. Here, also, are the *first figures ever published* on the amount and condition of metalworking production equipment in the maintenance shops of non-metal-working industries.

94 charts and tables... all yours... and ready *now* to help you boost your 1950 sales to America's biggest and most aggressive industry. So we'd like to say once more...

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Pictured at left is a standard drop bottom type container in three stages of operation—on the ground, in carrying position, and dumping.

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New Catalogs, Booklets Bulletins

MACHINES AND ATTACHMENTS

1 DRILLING MACHINES—*The Cincinnati Bickford Tool Co., Oakley, Cincinnati, Ohio.* 24-page catalog U-25 describes and illustrates a line of vertical drilling machines, including 21-, 24-, and 28-in. units. Several pages are also devoted to gang drills, drilling-machine parts, and tables of specifications.

2 HYDRAULIC RIVETERS — *Hannifin Corp., Chicago, Ill.* 28-page bulletin 150 contains information on hydraulic systems. Operating characteristics of pressure generators are discussed, as are applications of hydraulic power to riveters, punches, and presses. Engineering data and illustrations are contained in the booklet.

3 GRINDERS — *Cincinnati Grinders, Inc., Cincinnati, Ohio.* 12-page publication No. G-594 illustrates 14- and 16-in. plain grinding machines and features Filmatic spindle bearings. Specifications on both models are included.

4 BROACHES — *National Broach and Machine Co., Detroit, Mich.* 8-page pamphlet discusses the use of tools and fixtures for broaching profits. The design, manufacture, and sharpening of broaches, as well as workholding fixtures, is also covered.

5 BORING MACHINES — *Cincinnati Gilbert Machine Tool Co., Cincinnati, Ohio.* 8-page bulletin 1049 illustrates a number of installations of Gilbert horizontal boring mills and shows what jobs they handle. Data on the various machining operations include cutter speed, feed, and depth of material removed.

6 BENDING MACHINES — *Gamco, Inc., Detroit, Mich.* 4-page folder presents elliptical bending machines with 30- or 60-in. tables in 6- or 12-in. slide strokes. Formed parts made with a bender are illustrated.

7 GEAR HOBBER—*The Hamilton Tool Co., Hamilton, Ohio.* 4-page bulletin H-OO-49 presents No. 00 gear hobber for high speed, continuous hobbing of small spur gears, pinions, and special tooth forms. Features and advantages are listed, and specifications are given.

8 PUNCHES — *Wales-Strippit Corp., North Tonawanda, N. Y.*—4-page bulletin 7 describes perforating method for producing television, radar and radio chassis with stamping-press setups.

9 BENCH SHAPER — *South Bend Lathe Works, South Bend, Ind.* 4-page bulletin No. 500 presents a 7-in. shaper with a high stroke rate for small parts. Specifications and illustrations are included.

TOOLS AND ACCESSORIES

10 ROTARY FEED TABLE—*The Bellows Co., Akron, Ohio.* 8-page bulletin T-25 shows a 10-in. table that is rotated and indexed by manual, mechanical, or electrical operation of an air motor. Table is adjustable to 4, 6, 8, 12, or 24 positions.

11 GAGES—*Cadillac Gage Co., Detroit, Mich.* 36-page catalog covers complete range of gages made by the manufacturer. Thread gages, both plug and ring; concentricity gages; pipe-thread gages; cylindrical plug gages and ring gages; and snap gages are illustrated and described in complete tables. Other tables include standard information on dimensional constants, gage tolerances, and unified and American Standard screw threads.

12 MILLING CUTTERS — *McCrosky Tool Corp., Meadville, Pa.* 36-page bulletin 17-M illustrates face, side, and end mills with inserted carbide teeth that are held by Jack-Lock wedges. Locking these teeth into position is done with an Allen wrench. Milling cutters for machining cast iron, aluminum, and steel are specified.

13 TRIMMING DIES — *The Steel Products Engineering Co., Springfield, Ohio.* 12-page bulletin presents Brehm trimming dies for cutting flat edges and notching drawn shells. A number of case histories are shown, and die specifications are listed beside the illustrations.

14 LEAK DETECTOR — *Consolidated Engineering Corp., Pasadena, Calif.* 16-page catalog features leak detector, Model 24-101A, which uses the mass-spectrometer principle to detect leaks in both vacuum and pressure systems.

15 GAGES—*The Dow Mechanical Corp., Thompsonville, Conn.* 34-page catalog covers Dow gages and Tacomps for a simplified dimensional control over parts ranging from 1/16 in. to 5 in. in diameter.

16 ABRASIVE WHEELS — *Gardner Machine Co., Beloit, Wis.* 24-page booklet covers disks and wheels for disk grinders with descriptions and illustrations. Coolants and bonding agents are also discussed.

17 PUNCHES — *Blackhawk Mfg. Co., Milwaukee, Wis.* 4-page bulletin 50-B announces a hollow ten-ton hydraulic ram for Porto-Power hydraulic units.

18 REAMERS—*Lavalles & Ide, Inc., Chicopee, Mass.* 32-page catalog No. 50 presents tabulated specifications and illustrations on ground-flute reamers; including reamer sets, chucking reamers, taper-pin reamers, hand reamers, shell reamers, and arbors. Reamer blanks in fractional and wire-gage sizes are also listed.

HEAT-TREATING AND WELDING

19 SALT BATHS — *Heatbath Corp., Springfield, Mass.* A folder of data sheets contains information on metal-treating and metal-finishing products; including carburizing salt baths and barium-activated baths. Hardening data are included in several charts.

20 HIGH-SPEED HEATING — *Selas Corp. of America, Philadelphia, Pa.* An address by Frederic O. Hess, "Implications in High-Speed Heating for the Steel Industry", which was presented before the Association of Iron and Steel Engineers is available. The paper contains photographs and diagrams pertaining to high-speed heating.

21 WELDING RODS—*All-State Welding Alloys Co. Inc., White Plains, N. Y.* 28-page booklet lists rods and fluxes and contains tables of characteristics and general welding hints.

22 ELECTRODES—*Hobart Bros. Co., Troy, Ohio.* 16-page catalog EW-149 describes electrodes, including new models for welding mild steel, cast iron, aluminum, and high-carbon steels. Hard-surfacing electrodes and electrodes for gas welding are also described.

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23 WELDING RODS—*Eutectic Welding Alloys Corp., New York, N. Y.* 8-page pamphlet is illustrated with a number of case histories on the use of various welding alloys.

PLANT SERVICE EQUIPMENT

24 CONSULTATION—*Continental Industrial Engineers, Inc., Chicago, Ill.* 12-page booklet No. 127 describes a consulting and design service for industrial furnaces, ovens, and driers and for production lines and special automatic machines. Manufacturing, engineering, and construction are handled for complete industrial plants.

25 HYDRAULIC CYLINDERS — *Vickers, Inc., Detroit, Mich.* 28-page bulletin 49-55 lists a variety of oil cylinders, mounting brackets, and piston rods for industrial applications. Illustrations are included with data tables and engineering data on oil flow.

26 ROLLER CHAINS — *Chain Belt Co., Milwaukee, Wis.* 24-page bulletin 49-2 suggests broad applications of rubber chains by showing unusual applications of Baldwin-Rex roller chain.

27 BALANCERS—*Bear Mfg. Co., Rock Island, Ill.* 28-page catalog lists industrial balancing machines for both static and dynamic balancing of rotating machine parts. General information is included with an explanation of how dynamic balance can be obtained on unbalanced machine parts.

28 PALLET TRUCK — *Towmotor Corp., Cleveland, Ohio.* 4-page job study No. 91 depicts savings and efficiency obtained by handling materials with Towmotor Model W, an electric pallet truck with a capacity of 4,000 lb.

29 COMPRESSORS—*The Joy Mfg. Co., Pittsburgh, Pa.* 16-page bulletin provides an easy-to-use selector chart plus detailed section drawings and parts photographs illustrating operating features of a line of compressors.

30 DUST SUPPRESSORS — *Whiting Corp., Harvey, Ill.* Two 4-page bulletins describe vertical and horizontal hydroclone units for control of dust in industrial installations.

PARTS AND MATERIALS

31 CHAIN DRIVE—*Whitney Chain & Mfg. Co., Hartford, Conn.* Catalog SCF-49 lists silent chain drive which can be obtained from stock. Drive-requirement tables in the catalog eliminate the need for making tedious chain calculations. Applications requiring up to 50 hp can be handled from stock.

32 SPROCKETS—*Diamond Chain Co. Inc., Indianapolis, Ind.* 40-page catalog No. 709 covers chains and sprockets ranging in size from a pitch of ½ in. to 2 in. The catalog contains complete specifications and illustrations of chains of single, double, and triple links.

33 HYDRAULIC PACKINGS — *Minnesota Rubber & Gasket Co., Minneapolis, Minn.* 10-page catalog 9A covers O-rings, cord rings, and other packings made of synthetic rubbers made by injection molding. A table of comparisons between synthetic rubbers and natural rubber is included, as is a set of diagrams of O-ring packings, showing their positions in different grooves at increasing pressures.

34 SOCKET SCREWS—*Parker-Kalon Corp., New York, N. Y.* 16-page bulletin 490 includes engineering data on high-tensile-alloy and stainless-steel screws, stripper bolts, pipe plugs and hex keys.

35 EXPLOSIVE RIVETS—*E. I. du Pont de Nemours & Co., Wilmington, Del.* 24-page catalog describes high-speed industrial rivets and aircraft rivets. Applications of the two types of rivets are described and illustrated, and specification and engineering data are also included in the catalog.

36 STEEL CASTINGS — *Dodge Steel Co., Tacony, Philadelphia, Pa.* 16-page booklet covers a series of carbon and alloy steels for castings. Metals vary from normal carbon steel through various combinations of chromium, molybdenum, and other alloys.

37 PLASTIC FILMS—*R. M. Hollingshead Corp., Camden, N. J.* 16-page brochure on Corcon, a vinyl-plastic strippable film, describes the plastic which is applied with a spray gun to protect equipment. It can be stripped off like a banana peel when the equipment is wanted for use.

38 PLASTIC TUBING — *The U. S. Stoneware Co., Akron, Ohio.* 24-page booklet presents Tygon, a modified vinyl-plastic material which is usable as tubing in laboratories or as welding hose.

39 SPEED REDUCER — *De Laval Steam Turbine Co., Trenton, N. J.* 28-page bulletin G-WB lists worm-gear speed reducers in all available types, and standard specifications—complete horsepower ratings, overload ratings, and dimensions tables are included with information on how to select worm gears.

40 BOLSTER PLATES — *Danly Machine Specialties, Inc., Chicago, Ill.* 8-page data folder includes dimensional data on bolster plates in accordance with Joint Industry Conference specifications to facilitate die interchangeability.

41 AIR VALVES — *Mechanical Air Controls, Detroit, Mich.* 16-page catalog 49 features solenoid- and spring-operated pneumatic valves for controlling air cylinders. Valve action up to four ways can be attained.

42 MOTOR CONTROLS—*Allen-Bradley Co., Milwaukee, Wis.* 76-page catalog lists switches, starters, contactors, speed regulators, and accessories. Illustrations, condensed general information, dimensions, and prices are included.

43 AIR GAGES—*The Sheffield Corp., Dayton, Ohio.* 16-page catalog DTP-491 features Precisionaire gages with dials. Specifications on many models are listed, and typical applications are detailed with pictures and explanations.

44 STEEL—*United States Steel Corp., Pittsburgh, Pa.* 87-page booklet presents tabulated and charted data on "Steels for Elevated-Temperature Service". A general section on the behavior of steels at high temperatures is followed by information on creep; measurement of flow under stress; special testing equipment and techniques; structure, grain size, and stability of ferritic chromium and austenitic chromium-nickel steels; twenty-one steel compositions in comparison of their principal properties and partial data on other steels.

MISCELLANEOUS

45 PRESSURE VESSELS — *Nooter Corp., St. Louis, Mo.* 16-page brochure covers fabrication of steel and alloy tanks and pressure vessels in picture-story form for engineers.

46 RUST PREVENTION — *Nox-Rust Chemical Corp., Chicago, Ill.* 8-page folder is a chart of recommendations for storing metals and anti-rust treatment recommended.

47 CARBON PRODUCTS—*Union Carbide and Carbon Corp., New York, N. Y.* 32-page booklet, "Products and Processes", describes activities of five fields of Union Carbide: metals, chemicals, electrodes, carbons, and batteries.

48 PLASTIC EXTRUSION — *Tennessee Eastman Corp., Kingsport, Tenn.* 28-page booklet on Tenite extrusion presents data on handling of cellulose acetate and cellulose acetate butyrate.

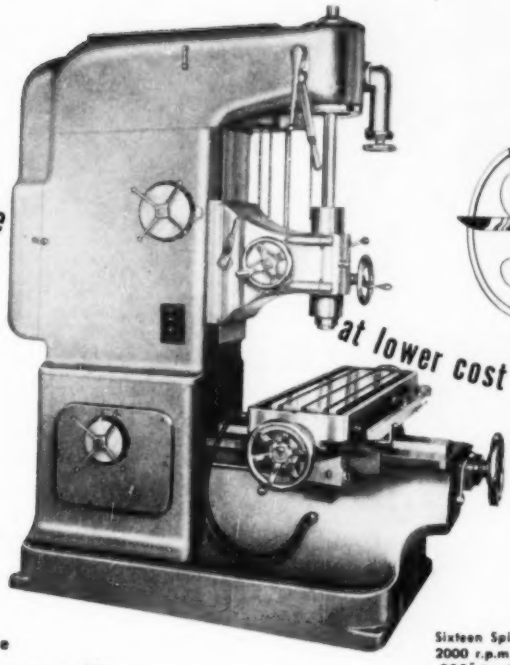
49 FOUNDRY SAND — *Millmaster Chemical Corp., New York, N. Y.* 8-page bulletin, "Berk Zircon Foundry Sand", describes value of the material in casting alloy and carbon steel, gray iron, and bronze.

50 MISCELLANEOUS—*P. Wall Mfg. Co., Grove City, Pa.* 24-page catalog 85 covers blow torches, soldering irons, compound kettles, safety shields, grease buckets, pipe straps, firepots, solders, paraffin supplies, oil carriers, paint pots, gongs, and shells.

KNIGHT NO. 50

FOR PRECISION BORING AND VERTICAL MILLING

more output in less time



at lower cost and less labor

Here is a single solid base machine

- — that will do the work of 2 or more machines
- — that performs an exceptionally wide range of difficult vertical milling and precision boring jobs
- — that eliminates time-wasting work transfers and expensive extra setup time
- — that does its work with toolroom precision and production line speed
- — that is ruggedly built with power to spare for handling the toughest jobs
- — that is engineered for extreme accuracy and easy, effortless operation
- — that pays off in increased output, lower labor saving and lower costs

Sixteen Spindle speeds, 40 to 2000 r.p.m. • 9 Spindle feeds, .005" to .010" • 100" table traverse per minute in both directions • 16 Table feeds, 5/16" to 20" per minute • 7½ h.p. Drive.

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attach to company letterhead

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We would like to have your catalog on the No. 50 and other Knight Milling Machines.

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MACHINERY COMPANY

3920 WEST PINE BLVD. ST. LOUIS 8, MISSOURI

KNIGHT Versatile Milling Machine

MORE GOODS for MORE PEOPLE at LOWER COST

"Taking care of small customers"

...that's only one of the things we mean by Service Plus!

● Many of our customers are probably classified as "small business." We were delighted to find, through a recent survey, that the men in charge of these so-called small companies are well satisfied with the service they get from United States Steel Supply Company. More than one said, "You take care of the little fellow." We know every order, large or small, is important to the man who places it. And we do our best to meet his requirements in handling it. If you need steel, from stock or in special sizes, forms or specifications, call us. Your order is as important to us as it is to you.

Service Plus is our promise of *extra* attention to your needs. It includes prompt delivery, large stocks of both standard and special sizes, and an unrivaled reputation for courteous attention to your every requirement. *Service Plus* means "You tell us and we'll do it if it's humanly possible."

U-S-S Carilloy Alloy Steels Manufactured to a Guaranteed Minimum Hardenability
HOT ROLLED AND COLD FINISHED BARS · PLATES · STRUCTURALS · SHEETS
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WHEN YOU DEAL WITH US, YOU GET Service Plus!

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UNITED STATES STEEL

DRILL and TAP IN ONE OPERATION

SUBLAND DESIGN NOW MAKES IT POSSIBLE

At last it has been done — a tool that combines these two jobs. Mohawks refinement of the subland design means short cuts that have been mechanics dreams - engineers ambitions for years.

DRILL
Smaller than the tap and yet larger than root dia. Circle ground its entire length.

TAP
Available in NC and NF threads in standard sizes ¼" to ¾".

Price lists available on request

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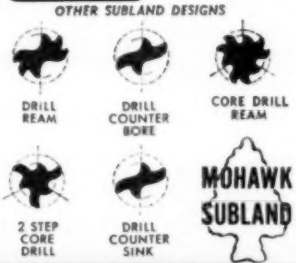

MOHAWK TOOL COMPANY
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Over 20000 GAGE DESIGNS

Ready to serve your every dimensional gaging need

Why start from scratch when you have a gaging problem? Undoubtedly we can promptly pull from the file a gage design that has already proved itself on a job similar to yours. This fund of practical gaging knowledge can't be equalled anywhere in the world . . . ***and it's ready to serve you.***

Look at the PLUS values in Federal-designed gages:

- Federal gives you whatever gaging system you need: mechanical, air, electronic, or electrical.
- Federal designs the gage to best serve your purposes: manual, semi-automatic, fully automatic.
- Federal plans the gage to give you positive size indications — beyond the shadow of a doubt.
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Take advantage of our 20,000 Gage Designs. Make Federal *your* source for all types of dimensional gages. Let us estimate on your next gaging problem. Send blueprints to FEDERAL PRODUCTS CORPORATION, 1123 Eddy Street, Providence 1, R. I.

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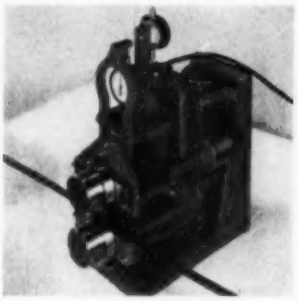
FEDERAL

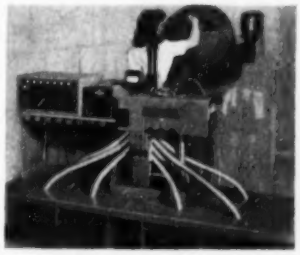
Largest manufacturer devoted exclusively to designing and manufacturing *all types of* DIMENSIONAL INDICATING GAGES

THREE CASES FROM THE FEDERAL FILE:

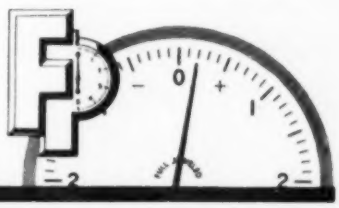
Federal Air Gage checks diameter and roundness of chrome plated cylinder bores — has upped inspection from 150 to 250 parts per hour. Gage is used at production to control plating process and reduce scrap.



Automatic Thickness Gage keeps continuous control of plastic coating deposited on copper conductor — saves materials — assures greater uniformity of insulated wire.



Electronic Sorting Gage segregates cylindrical parts into 4 OK diameter groups, over and under diameter groups, and over and under length groups. Speed — 3600 parts per hour. Diameter tolerances—.0001" per group.



The

GOSS & De LEEUW

ONE TWO THREE

7 spindle tool rotating automatic chucking machine

Four Machine Spindles **for boring, turning, facing and reaming operations on one to three ends provide greater and quicker production than any other "chucker" in the machine tool industry.**

Three Threading Spindles **perform from one to three right or left hand single or double threading operations, on one, two or three ends simultaneously, in perfect alignment, at productions from 100 to 500 pieces per hour.**

Write for further interesting details.

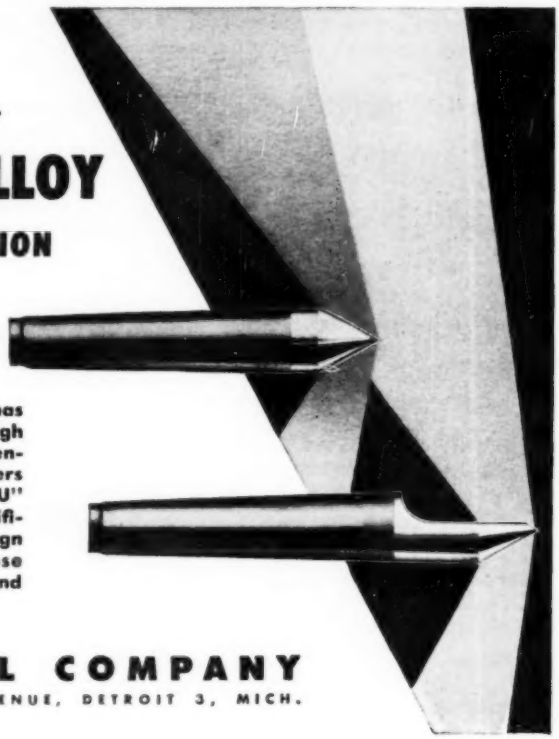
Goss & DeLeeuw
MACHINE COMPANY
KENSINGTON, CONNECTICUT, U.S.A.

For really *tough* going—

GORHAM M-40-U ALLOY

RESISTS WEAR AND ABRASION

3 to 10 times longer!



So superior is this alloy that by *actual test* it has shown results 3 to 10 times better than high speed steel and other alloy materials for centers. Standard "M-40-U" alloy tipped centers can be furnished from stock. Special "M-40-U" alloy centers can be furnished to your specifications, or our engineers will help you design special centers to fit your needs. Choose GORHAM "M-40-U" for top performance and long wear.

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Extra Dividends with CLEVELANDS

From experience, production managers know that Cleveland Presses give years and years of profitable trouble-free operation. You call this kind of a press a work horse. Above at the Bettcher Manufacturing Company of Cleveland, Ohio, you see a Cleveland 2-84-250 Press making the first form on two automotive body sections. Another Cleveland has already done the blanking while the third Cleveland is making the final form in this press production line.

In emergency cases these Clevelands have been called on to handle forming jobs requiring more than rated capacities. Though this is not the usual practice at the Bettcher plant, it has enabled them to handle many jobs that otherwise would have been impossible. The sound engineering and tested design that stands behind every Cleveland Press has paid off again.

Reserve capacity is only one of the *extra dividends* you can expect from your investment in a Cleveland Press. "Besides its extreme ruggedness you can also count on continuous accuracy and minimum maintenance with Clevelands," says Mr. Clarence H. Lange, plant superintendent at Bettcher.

Be sure to investigate the advantages offered by the complete line of Cleveland Presses. Standard presses can be furnished in a wide range of sizes and capacities in ten different types. A special Cleveland Press can be designed for your exact requirements. A-2707

THE CLEVELAND PUNCH & SHEAR WORKS CO. USA

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PUNCHING TOOLS & DIES

FABRICATING TOOLS

POWER PRESSES

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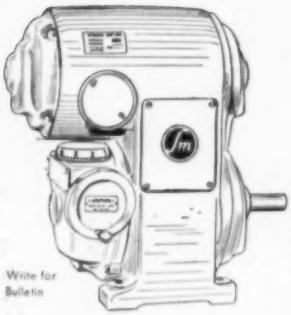

Co-ordinate your production flow with Sterling Speed-Trol electric power drives.

STERLING ELECTRIC MOTORS

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Plants: New York • Los Angeles • Hamilton, Canada
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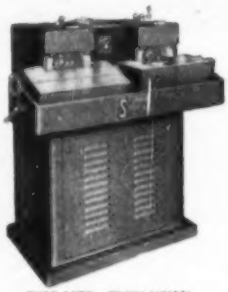
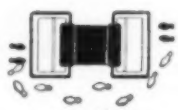


TYPE 10TD—TWIN WHEEL TOOL GRINDER

FROM ROUGH TO FINISH GRIND IN ONE STEP!

HEAVY DUTY—WET OR DRY
10" - 14" WHEELS

PROMPT DELIVERY



OLD WAY

Lost time between rough and finish grind.

Floor space wasted—Grinder must be away from wall.

NEW WAY

One step from rough to finish grind.

Conserve floor space — place Grinder against the wall.

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See this machine in operation at Booth 965, A.S.T.E. Show, April 10-14 in Philadelphia, Pa.

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Here is a wealth of practical information on the use of Functional Painting. This Special Report's 16 pages . . . illustrated in full color . . . provide you with valuable data on planned color in the shop as an aid to better production.

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American Machinist

McGRAW-HILL BUILDING
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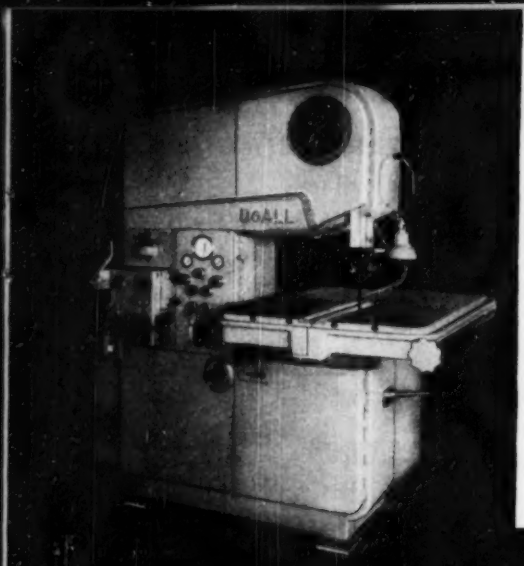
Efficiency of . . .
Continuous BAND CUTTING
Now Extended to the MACHINING of ALL SOLID MATERIALS

New DoALL Band Machines and Cutting Tools for 1950 give up to 200% faster production cutting and up to 100% longer tool life. Tough alloys and other materials that have defied economical cutting are now profitably machined.



Contour-matic — the first Band Machine Tool with Complete Hydraulic operation.

Super Zephyr—21 models for high speed sawing.

Contour Machines—5 models from 16" to 60" capacity.

Low-Cost Utility DoALLs, 5 models, various speeds, 16" capacity.

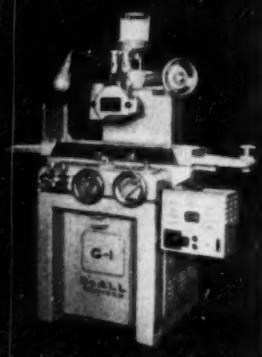
SEE DEMONSTRATIONS at A. S. T. E. SHOW
Philadelphia, April 10-14

These latest Tool Room and Manufacturing Tools will be in operation on materials demonstrating:

Line Milling	"Cool Grinding"
Line Grinding	"Crush Grinding"
Friction Sawing	Integrated Inspection

DoALL Exhibit #121 and #125

Gage Blocks are integrated with a complete line of measuring instruments.



"Cool Grinding" and the DoALL Super Precision Grinder, 7 models.

27 Kinds BAND CUTTING TOOLS

for

- Line Milling
- Line Grinding
- Contour Sawing
- Friction Sawing
- Continuous Filing
- Polishing
- Honing

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WRITE for literature and information
That will give you . . .
FREE DEMONSTRATIONS IN YOUR PLANT
No obligation, of course.

Forget Surface Variations

MERZ NEW-MATICS ACCURATELY MEASURE I.D. OR O.D. . . . REGARDLESS OF SURFACE CONDITIONS

● Only MERZ *New-Matic* Measuring Machines enable you to obtain identical I.D. or O.D. readings—*every time*—on parts of like diameter . . . *regardless of surface variations.* In MERZ *New-Matics,* a synthetic ruby button contacts only the highest surface points. Unlike conventional gages—where compressed air directly touches *all* surfaces, high and low alike—MERZ *New-Matics* are unaffected by any surface variations.

For the same reason, MERZ *New-Matics* are the only air-actuated units capable of accurately gaging parts in which perforations or keyways have been machined. MERZ *New-Matic* Measuring Machines also permit accurate gaging to the extreme edges.

For full details on these and many other advantages of MERZ inspection equipment, write for free 20-page book which illustrates and explains the *New-Matic* principle of measuring and sorting.

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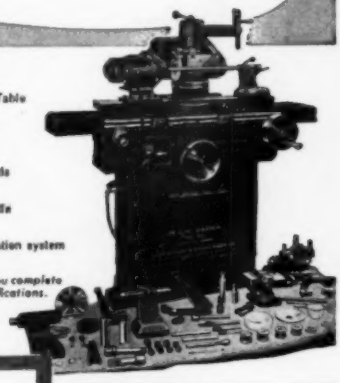
MERZ "Master" *New-Matic* Measuring Machine. Other models for every inspection purpose.

FOR SHARPENING . . .

- Milling cutters
- Gear cutters and reamers

GRAND RAPIDS No. 60

Universal cutter and tool grinder



Features:

- Anti-Friction Bearing Table
- Four Spindle Speeds
- Two Work-Head Speeds
- Greased-for-Life Spindle
- Bijur, one-shot lubrication system

Your letter will bring you complete information and specifications.

GALLMEYER & LIVINGSTON COMPANY

GRAND RAPIDS GRINDERS

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GEAR ECONOMY BEGINS WITH BRAUN

The Braun Gear Company has been shaping the wheels of industry for more than 38 years, producing gears of quality at economical prices. Braun's brand new plant is now more than ever equipped to supply the things that count in gears—precision workmanship, fine materials, good design, and prompt service.

Send samples or prints and specifications for immediate quotations. Whether your requirements are for one gear or thousands, you will find that economy begins with Braun!

BRAUN GEAR COMPANY

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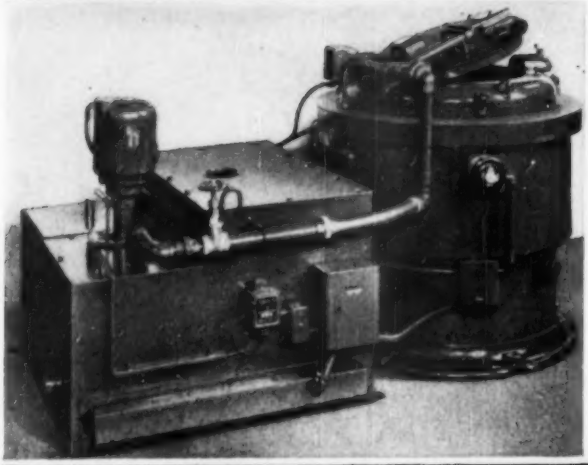
Basic principles of lubrication govern the performance of sleeve bearings. Proper application of those principles and the innate quality of Bunting Bronze Bearings give assurance of successful operation in service. The wide experience of our engineers is at your disposal. THE BUNTING BRASS & BRONZE COMPANY, Toledo 9, Ohio. Branches in Principal Cities.
BRONZE BEARINGS
PRECISION BRONZE BARS
BUSHINGS
64
Bunting

CONTROLLED IMPREGNATION by the BARRETT "HYDEWA" Centrifugal Process offers many advantages



The Centrifugal Process is limited in application only to the size of the articles that may be rotated in fair balance in the revolving bowl. Coils, condensers, transformers, braiding cotton insulated wire, paper tubes, pressboard spacers, rawhide and bristles, are but a few of the many typical products now being processed in Barrett Impregnators. Many products heretofore considered impractical for satisfactory impregnation by other methods have been successfully handled.

The Barrett Method assures fast production, by reducing the customary hours to minutes, high penetration, with controlled impregnation, also positive expulsion of air from the articles being impregnated.

Basic units are self-contained, direct motor driven. Special arrangements and supplemental equipment also provided.

Submit your problem and samples for test and recommendations.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

Get HIGH PRODUCTION ACCURACY on internal cylinder finishing with FULMER HONING

WITH Fulmer Honing Machines, stock can be removed from internal cylinders, ½" to 30" diam., much faster, easier, cheaper, than by any other method, and maintain high accuracy. Stock removal ranges over 90 cu. in. per hour. Hold to ± .0001" tolerances on bore size, straightness, roundness, with any desired surface finish.

CHECK THESE TYPICAL PRODUCTION EXAMPLES OF FAST STOCK REMOVAL BY FULMER HONING MACHINES:

PIECE	LENGTH	DIAMETER	STOCK REMOVED	TIME
Hardened Pump Liner	27"	7.250" + .0005"	.015"—.018"	10 min.
Forged Gear Blank	Two 6" Bores	4.250" + .0002"	.005"	1 min.
Chrome Plated Diesel Liner	32"	8.500" ± .0005"	.004"—.006" of chrome	3 min.

(Above) Fulmer Model 10-25, honing 3⅜" bore aircraft cylinder, removing .006" of stock. Rates 24 cyl. per hour.

FULMER COMPANY NOW EXCLUSIVE U. S. DISTRIBUTOR FOR ALEXANDER BALL HONING TOOLS

Available in sizes from ½" to 30" diam.

FULMER Honing Machines offer the greatest value in the honing field. Write now for new, fully illustrated bulletin giving valuable data on honing applications, Alexander Ball tools, and specifications and construction details on all models of Fulmer Honing Machines. Send for your copy today.

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These three factors are the key-note of our special tools and machinery. Columbus Die-Tool builds and designs the tool for your particular purpose and will solve the toughest tooling problems effectively and promptly. Do not hesitate to consult us, our experience in this field is most comprehensive.

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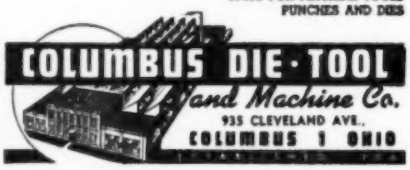
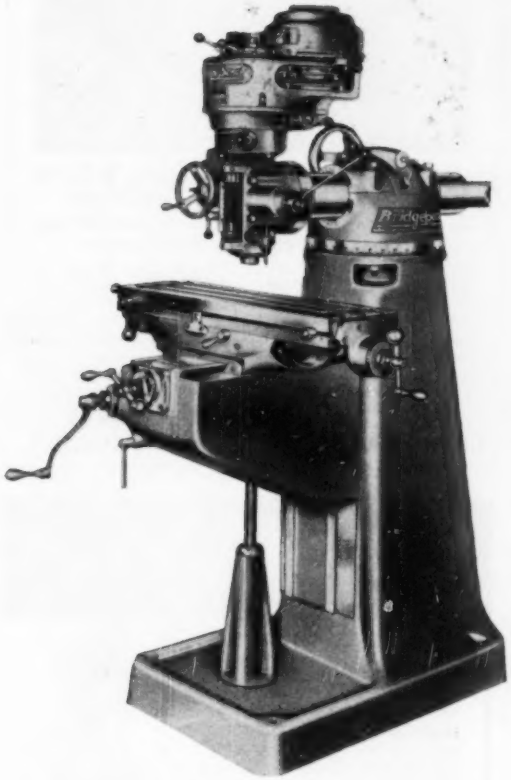


These NEW DEVELOPMENTS
mean even greater utility

Bridgeport



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Designed for producing concave and convex shapes. Specially useful in producing drop forge dies, molds and cavities, metal core boxes, etc.

HEAVY DUTY RIGHT ANGLE ATTACHMENT

For milling and drilling at right angles.

The Bridgeport Turret Milling Machine with its New 1 H.P. Milling, Drilling and Boring Attachment has had its remarkable versatility still further extended through the development of Cherrying and Right Angle Attachments shown at work here. Furthermore the new Bridgeport Milling Machine Vise and Boring Head add greater convenience and capacity to a machine which has already found outstanding acceptance in the World's leading die shops and tool rooms as well as on the production lines of countless metal working shops.

Full details are available on request.

LIGHT DUTY RIGHT ANGLE ATTACHMENT

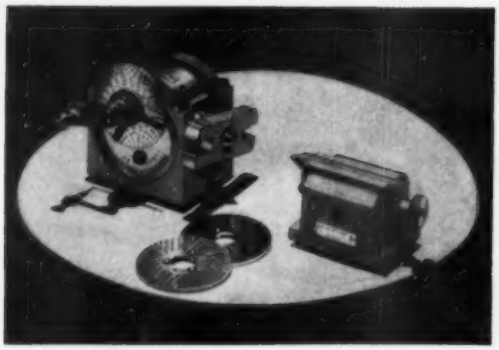
Specially designed for milling and drilling narrow, deep molds and cavities.

BOOTH NO. 1031 ASTE SHOW

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines



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MARVIN MICROMETER BORING HEAD. No. M-1000

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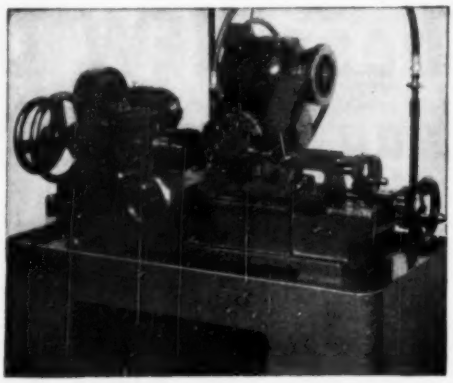

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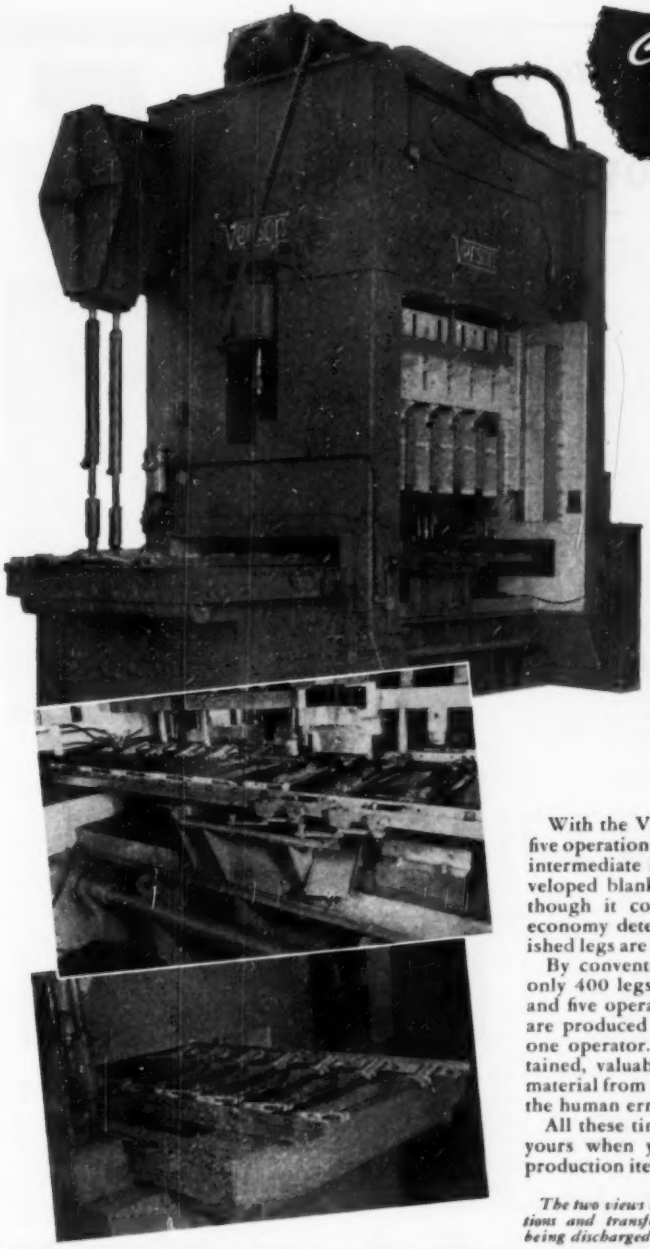

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The two views at left show (above) a close-up of the die stations and transfer mechanism and (below) completed legs being discharged from press.

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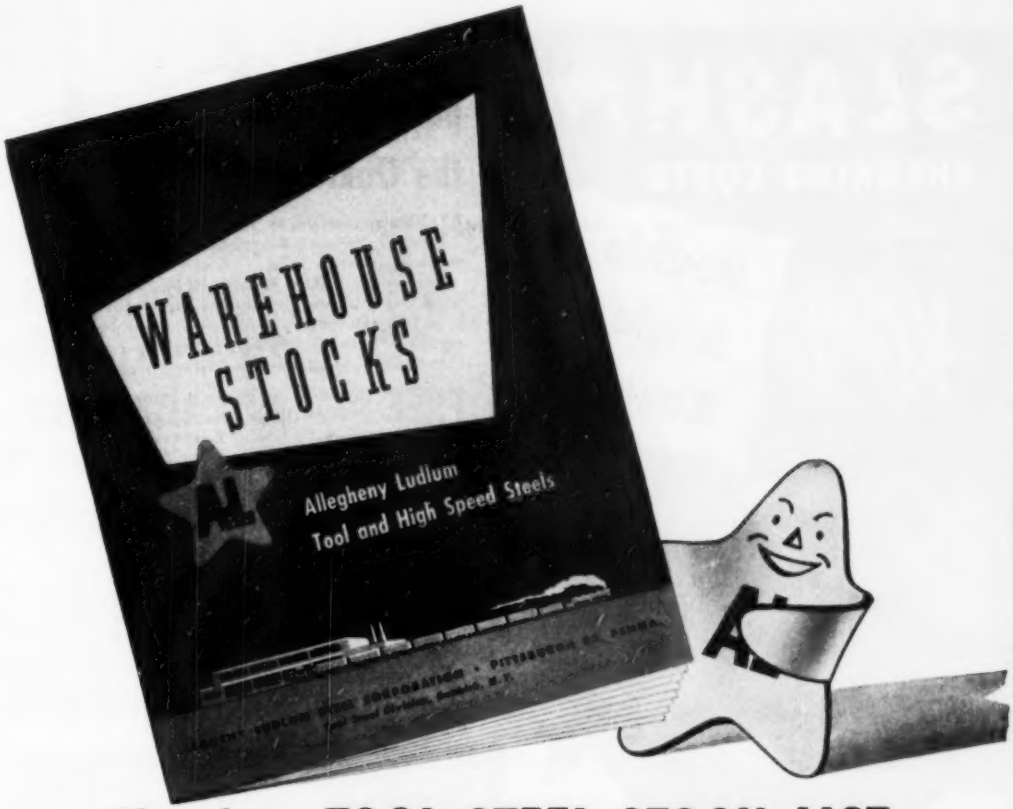

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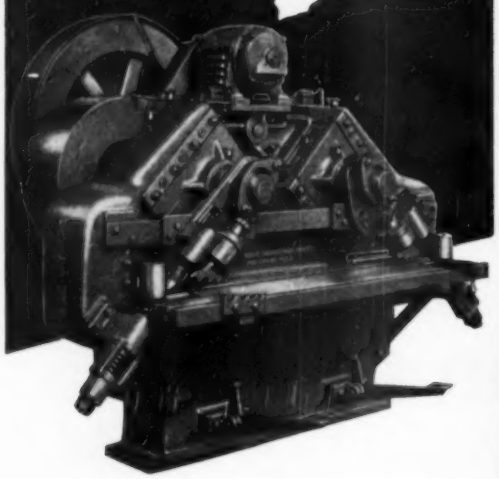

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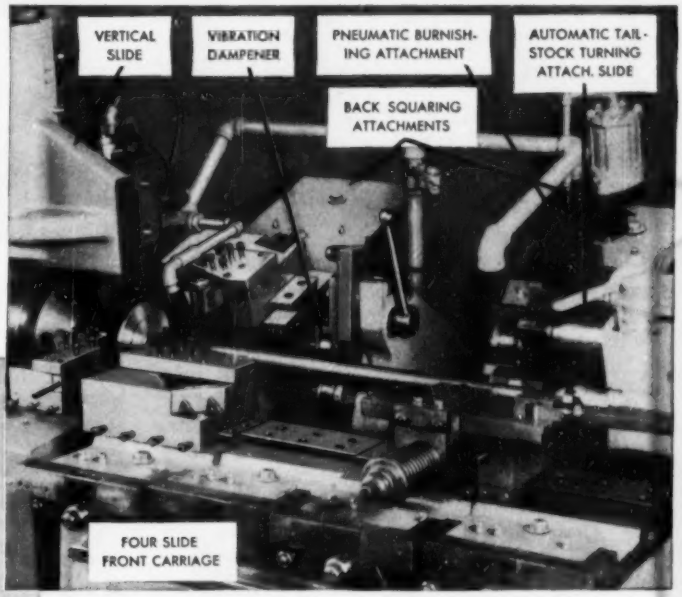
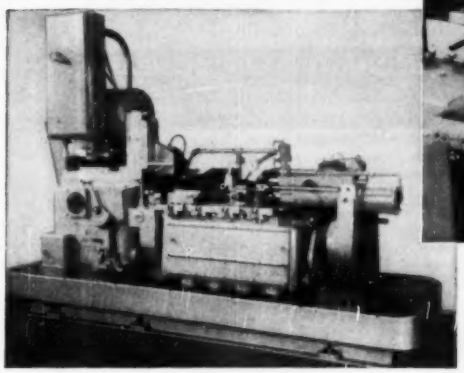
MODEL AR Lo-swing LATHE ROUGH AND FINISH TURNS AXLE SHAFTS IN ONE OPERATION AT HIGH PRODUCTION RATE





Problem: To rough and finish turn axle shafts with two cuts on flange faces and splined end, and to burnish oil seal diameter.

Solution: The Model AR Lo-swing Lathe selected for this job was equipped with a four slide front carriage, two automatic back squaring attachments, a vertical facing slide mounted on the headstock and an automatic tailstock turning attachment.

The shafts are delivered to the Lo-swing Lathe with ends centered and with two shallow driving pin holes drilled in the flange. After mounting the shaft between centers, a spring operated "Vibration Dampener" is set against the rough forged shaft to eliminate whip and vibration at high cutting speeds.

The machining cycle is divided into two distinct phases ... roughing and finishing. The front carriage and back attachment tools operate simultaneously, rough turning and rough facing the flange as well as the bearing diameters and the splined end. The roughing tools are then withdrawn from the cut and the flange is finish faced with tools mounted on the third slide, while a separate tool mounted on the tailstock turning attachment takes a light finishing cut over the splined end of the shaft. The burnishing attachment moves into position during the latter part of the finish turning and burnishes the oil seal diameter situated near the splined end. All operations are performed automatically, the operator simply loads and unloads the part. Total floor to floor time is 1.05 minutes per shaft.

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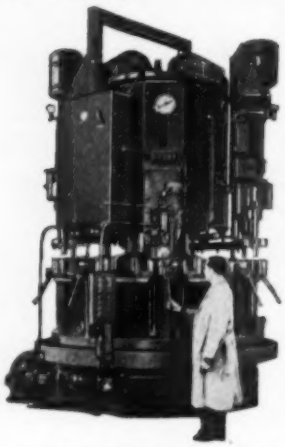
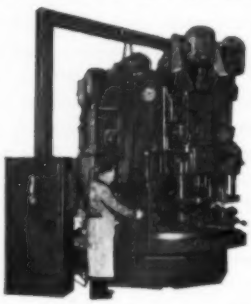
Here are two interesting examples of high production machining in relatively small floor space. Rather than string each operation out in a long line with conveyors, the operations are performed in fixtures held on a rotary indexing table.

5 OPERATIONS ON 240 PARTS PER HOUR IN 79 SQ. FEET . . .



This type VSI vertical indexing drilling machine is designed for drilling, reaming and chamfering five bolt holes and drilling and chamfering one 18° hole in automotive rear axle.

4 OPERATIONS ON 130 PARTS PER HOUR IN 84 SQ. FEET



This type VSI special vertical automatic indexing machine is provided with eight two station fixtures for holding one each right and left hand spindle assembly supports. Operations include drilling, reaming, chamfering and sawing. While each head is hydraulically actuated, on the machine illustrated, electrical mechanical heads are also available.

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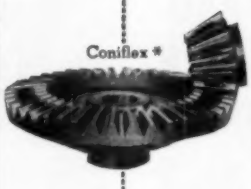

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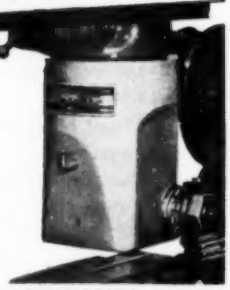

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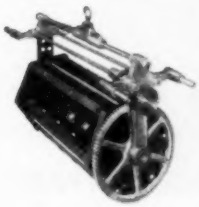
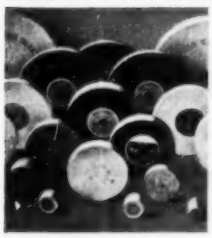


You don't have to guess what qualities make one plating barrel better than another. It must: withstand high acid and alkali solutions... endure continuous production... be unaffected by extreme temperature changes. If a plating barrel does these things, then you can load the cylinder and run it through the entire plating cycle. Result: no transfer of parts... high speed production... low handling costs. H-VW-M Mercil type plating barrels have all these qualities. Ask for Bulletin PB-107.



Guessing is out when it comes to selecting polishing wheels. Such factors as type and shape of work, and the finish desired must be considered. The wheel itself should be flexible, of uniform density and properly balanced. Be sure, too, that it is made of all new materials so necessary for maximum strength and wearing qualities as well as ability to hold the abrasive. All these factors are inherent in the full line of H-VW-M cloth, canvas, leather and felt polishing wheels. Ask for Bulletin W-102.

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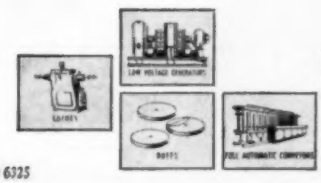

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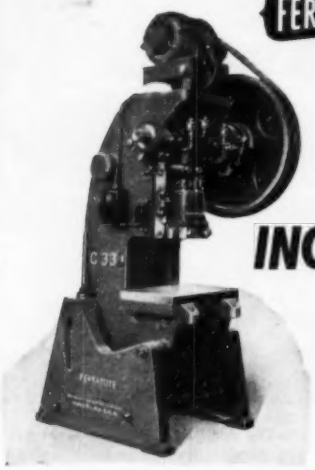

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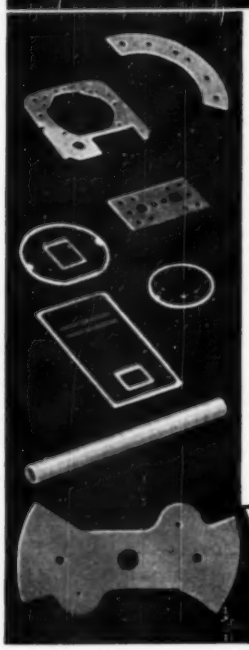

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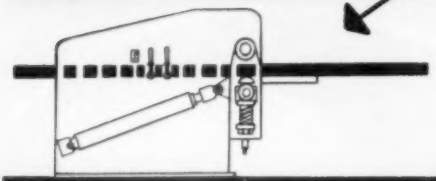

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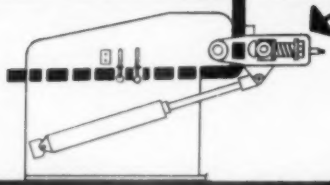
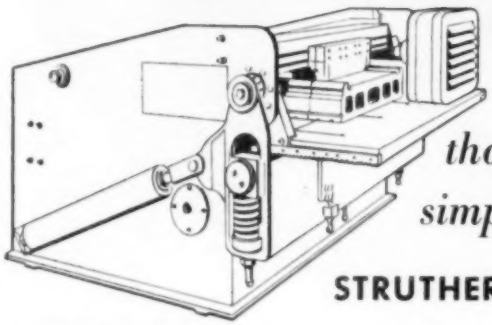


in a single operation



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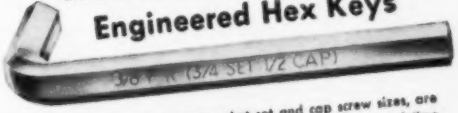

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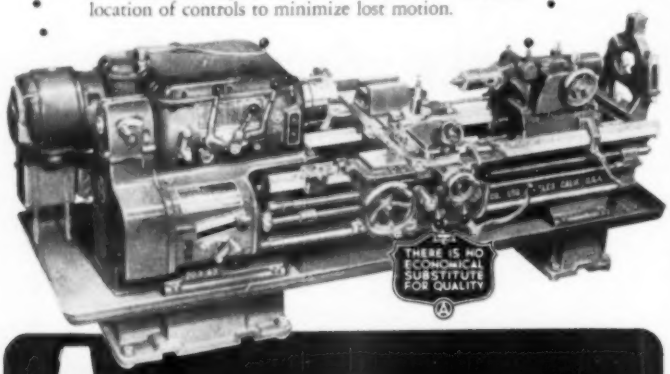

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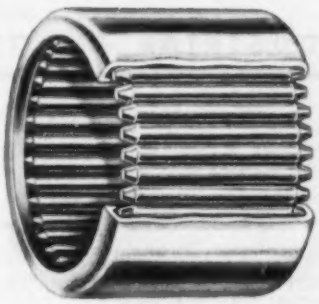

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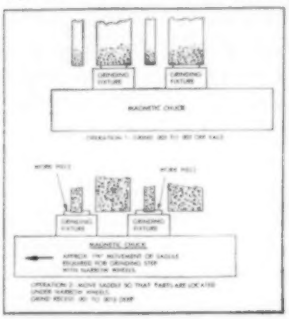

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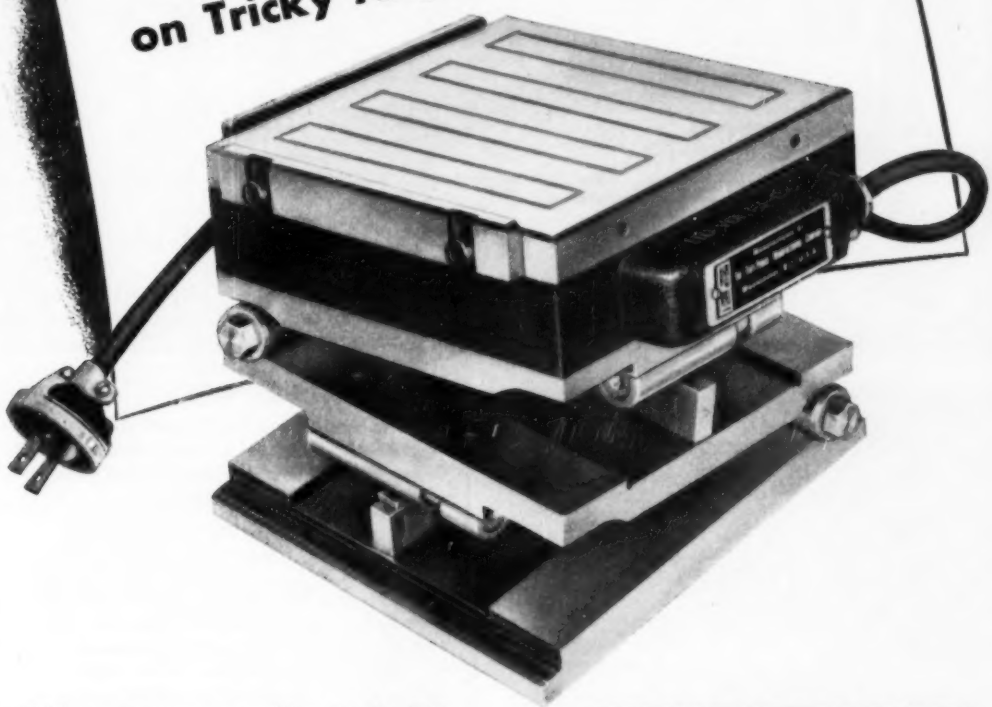

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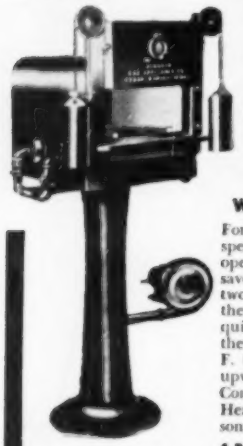

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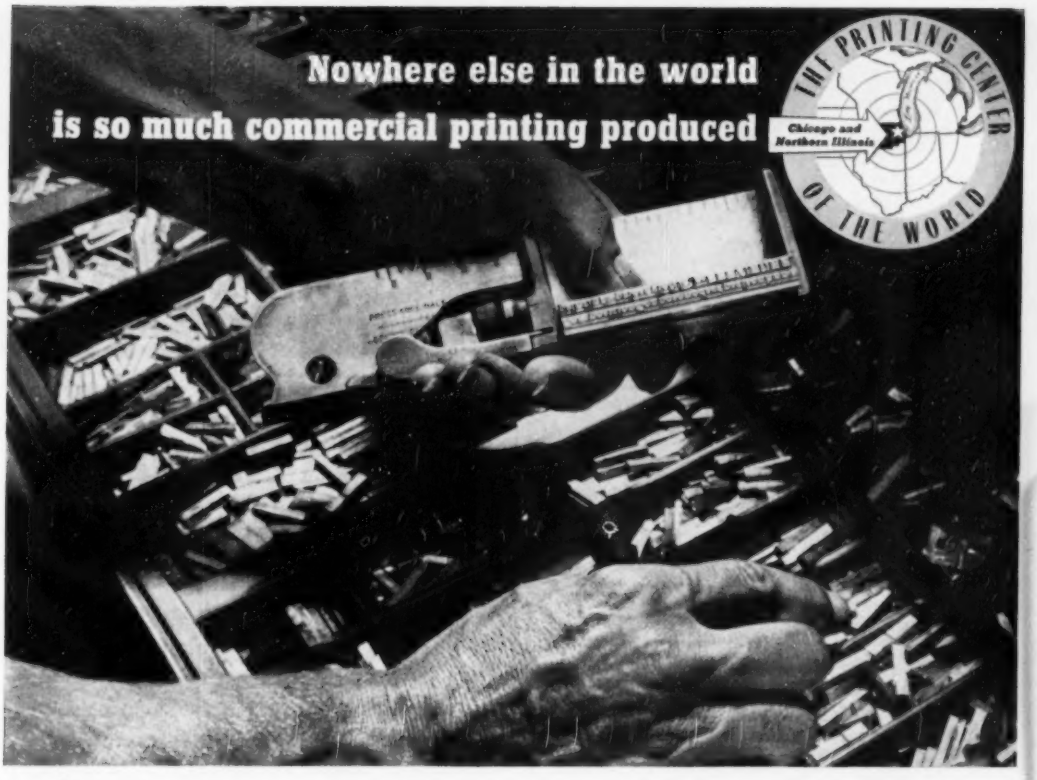
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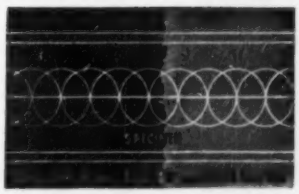

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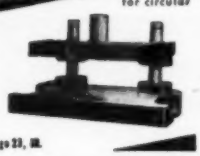

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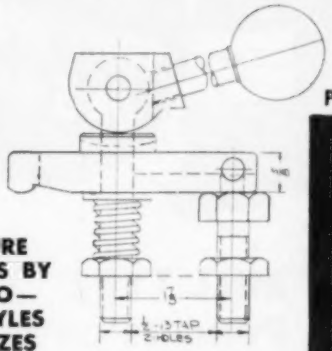

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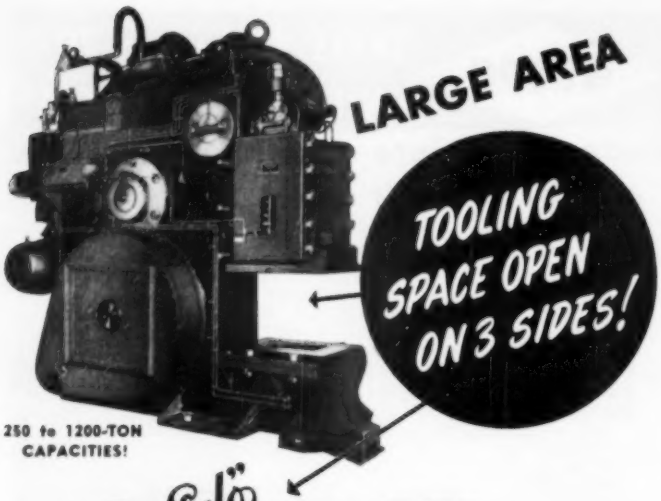

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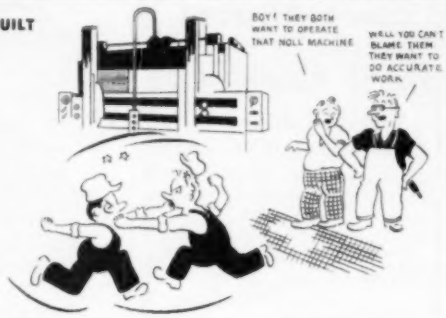

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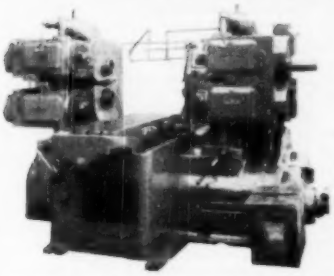

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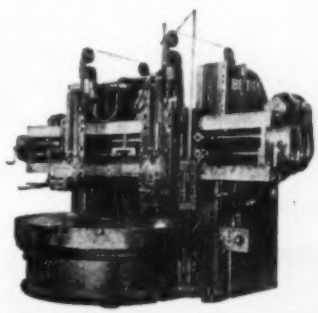
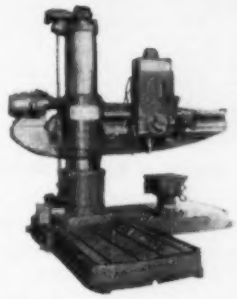
42" Bullard Vertical, 220/440 motor.
54" Bullard Vertical 220/440 motor.
42" Gisholt Vertical, 220/440 motor.
120" Niles, B & Pond Vertical



Betts 100" Vertical Boring & Turning Mill. 1944 machine. 2 plain heads. Complete Electrical.



Cincinnati-Bickford 6'-19" SUPER-SERVICE Radial Drill. New in '42. Standard base plus angle base. 36 spindle speeds. Necessary motors & controls.

RADIAL DRILLS

Cinci-Bickford 6' Arm, 15" Col. 24 Speeds.
Cinci-Bickford 5' Arm, 13" Col. 24 Speeds.
Cinci-Bickford 4' Arm, 13" Col. 32 Speeds.
Cinci-Bickford 3' Arm, 9" Col. 12 Speeds.
Cinci-B. Super-Service 4'-11". 24 Speeds
Mueller 3'-11" Universal. M. Dr. #4 M.T.

TURRET LATHES

Bardons & Oliver #1 Electric Turret Lathe. ¾" cap. Has bar feed & collets.
Simmons Microspeed 1" Cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed 1½".
W-Swasey #3 Univ. 1⅛" cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3⅛" cap., M. Dr.
Warner & Swasey #1A Universal Heavy Duty Saddle Type Turret Lathe. Serial #648220. Capacity —2⅛" rd., Gr. Hd. 12 speeds. Coolant system, bar feed, chuck & tooling. Immediate delivery.

UNIVERSAL MILLING MACHINES

B & S #2, 20"x5"x17½".
B & S #1½, 20"x7"x18".
Garvin #2MU, 24"x8"x18".
Kempsmith #2, 28"x8½"x18".
Cincinnati #2M, 28"x10"x18".
B & S #3, 34"x10"x21".
Cincinnati #35 34"x12"x20".
Cincinnati #2, 28x7½x18
Kempsmith #3, 34x10x19
LeBlond #4 Hvy. Duty. 40x10x14

PUNCH PRESSES

O.B.I. Toledo #5, 44 tons cap. motor dr.
O.B.I. Bliss #18, 19C, 20, 20B, 21 motorized.
O.B.I. Michigan, 36 tons cap. Wide ram & bed.
#68C Bliss Dble. Action 3-Crank.
#91C Toledo Sgle. Act. Dble. Crank S.S.
#30S Bliss S.S.S.A. 95 tons Cap.
#3A Bliss S.A.S.S. Dble. Crank. 42 Tons.
Johnson NEW O.B.I. #5 4" Str. 51 Tons.
Walsh #4. 3" Str. 38 Tons. O.B.I.

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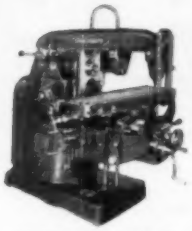
PLAIN MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest
No. 1A Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1 Special Plain K & T Milwaukee, m.d.
No. 1½, 2, 3 Cincinnati, cone
No. 2B Brown & Sharpe, m.d., latest
No. 2 Cincinnati H.S. Dial, m.d., latest
No. 2 Rockford, m.d.
No. 2HL Milwaukee, m.d., latest
No. 3 Standard Cincinnati, m.d.
No. 3B Brown & Sharpe, m.d., late
No. 3, 4 Kempsmith Mast-Miller, m.d.
No. 3B Milwaukee, m.d.
No. 3 Van Norman Duplex, s.p.d.
No. 4 Cincinnati H.P., m.d.
No. 4 Ohio, cone
No. 5 Cincinnati, rect. overarm, m.d.
No. 5 H.D. LeBlond, s.p.d.
No. 5B Brown & Sharpe Heavy, m.d.



Cincinnati Plain Dial Type Milling Machine

UNIVERSAL MILLING MACHINES

No. 1B Milwaukee, m.d.
No. 2A Brown & Sharpe, s.p.d.
No. 2 Cinci. Medium Speed Dial, m.d., latest
No. 2 Cincinnati, cone, motorized
No. 2M Cincinnati, m.d.
No. 2 Kempsmith, cone
No. 3 Kempsmith, cone
No. 3A Brown & Sharpe, s.p.d.
No. 4A Brown & Sharpe, m.d.
No. 4 Cincinnati H.P., m.d.
No. 4G LeBlond, s.p.d.

VERTICAL MILLING MACHINES

No. 0B Cincinnati, m.d., latest
No. 1 Cleveland, m.d.
No. 2M Cincinnati, m.d.
No. 3, 4 Cincinnati H.P., m.d.
No. 2, 3, 4 Cincinnati High Speed Dial, m.d., latest
No. 2, 3 Cincinnati Medium Speed Dial, m.d., latest
No. 2H, 4H Milwaukee, m.d., latest
No. 2HL Milwaukee Swiveling Head, m.d., latest
No. 2K, 3K, 4K Milwaukee Dial, m.d., latest
No. 2½B, 3B, 4 Milwaukee, m.d.
No. 3V Toledo, s.p.d.
No. 3V Van Norman, m.d., latest
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice, m.d., latest
No. 9 Becker, cone
Cincinnati Hydromatic, m.d., 2 spindles
28-120 Cincinnati Hydrotel, m.d., 1942

MANUFACTURING TYPE MILLING MACHINES

No. 0B Cincinnati Model EA, m.d., latest
No. 12 Brown & Sharpe, m.d.
No. 1-12 Cincinnati, m.d., latest
No. 1-18 Cincinnati, m.d., latest
No. 2-18 Cincinnati, m.d., with rise and fall, latest
No. 2-24 Cincinnati, m.d., latest
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
No. 4-48 Cincinnati Duplex Hydromatic, m.d., latest
No. 34-30 Cincinnati Duplex Hydromatic, m.d., with tracer control, latest
No. 34-36 Cincinnati Plain Hydromatic, m.d., with tracer control, latest
No. 56-72 Cincinnati Duplex Hydromatic, m.d., latest
No. 56-90 Cincinnati Duplex Hydromatic, m.d., latest
Type P Ohio Mfg., m.d.
Sundstrand Rigidmill, m.d.
4" Pratt & Whitney Spline, m.d.
No. 33 Kempsmith Mfg., s.p.d.
18", 24" Cincinnati Plain Automatic, m.d.
24", 28" Cincinnati Duplex Automatic, m.d.
30"x30"x12" Ingersoll Slab Milling Machine, 2 heads, m.d.
72"x6" Ingersoll Single Horizontal Spindle Traveling Housing Milling Machine, m.d.

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WARNER & SWASEY #1A, PRESELECTOR BAR & CHUCKING, serial 596,000
WARNER & SWASEY #3A, PRESELECTOR BAR & CHUCKING, serial 661,000
HEALD #72A5 Int. Grinder, ser. 24,000
NORTON TYPE C 6 x 18 GRINDER, ser. 21,000
GLEASON 12" BEVEL GEAR GENERATOR
VAN NORMAN #2L MILLING MACHINE
WARNER & SWASEY #3 BAR, serial 659,000; #2 BAR, serial 574,000

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CINCINNATI GILBERT 3½" bar, Floor Type, M.D.
DETRICK & HARVEY 4" bar, Floor Type, M.D.
GIDDINGS & LEWIS #25T, 2½" bar, Latest Type
GIDDINGS & LEWIS #45, 4½" bar, Motor Drive
GIDDINGS & LEWIS #45, 4½" bar, Motor Drive
HEALD 48A, 40 single end, Hydraulic, Latest
LANDIS—#35—3½" bar, floor type, M.D.
LUCAS #41, 3" bar, Table Type, Late Type
LUCAS #43, 5" bar, Table Type, Late Type
NILES-BEMENT-POND 5", 6" bar, Floor Type, M.D.
UNIVERSAL 3" bar, high speed latest type

BORING MILLS—Vertical
BULLARD 6", 8 spdle, Mult-Au-Matic, Type J, Latest
BULLARD 16" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 12" 6-spindle Mult-Au-Matic Type D, Latest
BULLARD 24", 26" Turret "New Era" Side Head, M.D.
BULLARD 24", 36" Vert. Turret "Spiral Drive", M.D.
BULLARD 24", Latest Type
High Speed, Latest Type
COLBURN 72", 2 swivel heads, PRT, M.D.
KING 62", 2 swivel heads, Rapid Traverse, AC M.D.
NILES 100", 2 swivel heads, Rapid Traverse, AC M.D.

BROACHES
AMERICAN V-2, 6 ton Hyd., Latest Type
CINCINNATI 1-30, 3-30, Duplex Vertical Surface, Hyd., Double Ram, Model EB, Latest Type
LaPOINTE 5-36 Vertical, Hyd., Latest Type

DRILLS—Miscellaneous
BARNES H-3 "Hydran," Hydraulic, 3" capacity—for inverted drilling, Latest Type
LELAND & GIFFORD 3-LMS, 3 Spindle, Latest Type
LELAND & GIFFORD—4, #2MS, Single Spdle.
LELAND & GIFFORD #2LMS 2 spindle, Latest
LELAND & GIFFORD #4AL Multiple, 30 spindles, Hyd., Latest Type
NATCO #4AL Multiple, 30 spindles, Hyd., Latest Type

DRILLS—Deep Hole
BARNES 420/2 Spindle Hydraulic, Latest Type
LeBLOND #2 Single Spindle, Hydraulic, Latest Type

DRILLS—Radial
AMERICAN 4' arm 11" column, "Hole Wizard", 3-way Base, Latest Type
AMERICAN 4' plain Triple Purpose, Motor Drive
AMERICAN 5' arm 13" column Plain, M.D.
CINCINNATI BICKFORD 5'13" Column, Plain, M.D.
CIN. BICKFORD 6' arm 15 col. Plain or Univ., M.D.
DRESSER 5' arm 15" column Univ., M.D.
WESTERN 6' arm 20" column Plain, Latest Type

GEAR CUTTING EQUIPMENT
BARBER COLMAN Type A Hobber, Long Base, for Splines, Latest
BARBER COLMAN #12 Hobber, Single and Double Cutter, Motor Drive
Overarm, Motor Drive
BILGRAM 6" and 16" cap., Bevel Gear Gen., M.D.
BROWN & SHARPE 6-56 Gear Cutter, Motor Drive
BROWN & SHARPE #13 Spur and Bevel Cutter, M.D.
CROSS #1 Tooth Rounding Machine, Motor Drive
CROSS #1 Universal Gear Chamferer, Latest Type
CROSS #50 Universal Gear Chamferer, Latest Type
FELLOWS Model 6, 6A, 6AA, 6Z2, Z, 7A, 7, 7B, 7B5, 7T
High Speed Gear Shaper, Latest Type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #13LS Lapper, Latest Type
FELLOWS 8M Red Liner, Latest Type
GLEASON #14 Hypoid Spiral Generator, latest type
GLEASON 3", 12" straight bevel generator, latest type
GLEASON #4, #6, #18 Bevel and Hypoid Tester
GLEASON #16 Hypoid Generator, Latest Type
GLEASON #26 Hypoid Generator, Latest Type
GLEASON 24", 77", 90° Straight and Bevel Gear Planer, Motor drive
Latest type
GOULD & EBERHARDT 12H Hobber, with DIFF., Latest type
GOULD & EBERHARDT 96H Hobber, with diff, M.D
GOULD & EBERHARDT 9", Grinder, hyd., latest
PRATT & WHITNEY 10" Grinder, hyd., latest Type
SCHUCHARDT & SCHUTTE #1 Hobber, Motor Drive

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3 x 12, Latest Type
LANDIS 4x12 Type B, Plain Hyd. Latest Type
LANDIS 6"x18" Type C Plain, Hyd., Latest Type
LANDIS 22"x130" Plain Roll, Motor Drive
NORTON 6"x18", 6"x36", 14"x36", 16"x72" Type C, Plain, Latest Type

GRINDERS—Miscellaneous
BARBER COLMAN #3, #4 Hob Sharpener, Latest
BROWN & SHARPE No. 13 Univ. Cutter & Tool, Lat.
BRYANT #3, #6, 16-C-16, 16-CP-16, 24-36" Internal, Hydraulic, Latest Type
CINCINNATI #2, Centerless "Filmatic", Latest
CINCINNATI "Monoset" Tool & Cutter, Latest
FITCHBURG 14"x32" Spline, hydraulic, latest
GARDNER 24-32" Disc Grinder, Latest
GLEASON #12 tool sharpener, Latest Type
HEALD 72A3, 72AB "Gagematic" Internal, Latest
HEALD 72A3, 72AS, 74 Internal, latest
HEALD #36 Internal, Centerless, Sitematic and Gage-matic, Latest Type
JONES & LAMSON #15, #18 Auto Thread, latest
KEARNEY & TRECKER Face Mill Grinder, Latest
LANDIS #6, 6x24 Thread, latest type
LANDIS #12 Centerless, Hydraulic, Latest Type
LANDIS #12 Centerless, Hydraulic, Latest Type
La POINTE 60" Universal Broach Sharpener, Latest
La POINTE 60" Auto., round broach, M.D.
THOMPSON 6"x48" Auto., round broach, #639, #73 Oscillating Radius Grinder, Latest Type
VAN NORMAN #666 Crankshaft ReGrinder, Latest

GRINDERS—Surface
BLANCHARD #11, 16" dia. mag. chuck, Latest
BLANCHARD #16, 24" dia. mag. chuck, Motor Drive
BLANCHARD #16, 24" dia. mag. chuck, Motor Drive
BLANCHARD 16A Vertical, Disi Feed, Motor Drive
DO-ALL, Model G-7, 9"x20", Hyd., Latest Type
HANCHETT Series 300 12"x48" Vert. Hyd., Latest
HANCHETT #36 Vert., 36" dia. mag. chuck, Latest
HANCHETT #120, 30x120" Plano, Hyd., Horiz. Latest
HEALD #22 Rotary, 12" chuck, latest type
HEALD 25A—rotary—16" and 20" chuck, Hyd., Latest
NORTON 6x18 Hydraulic, latest type
THOMPSON 12x12x24 Type D Hyd., Latest Type

JIG BORERS
KEARNEY & TRECKER Model B Autometric, Latest
PRATT & WHITNEY 1A, Motor Drive
SOCIETE GENEVOISE (SIPF) #4 Precision, Table 19"x27", Motor Drive

LATHES—Engine and Mfg.
AMERICAN 16"x34", Centers, Geared, Motor Drive
AMERICAN 42"x200" Centers, 1 carriage, Motor Drive
AMERICAN 26"x200" centers, 2 carriages, motor drive
AMERICAN 26"x200" centers, 2 carriages, M.D.
BRIDGEPORT 26"x32" bed—2 carriages, M.D.
HENDEY 12"x30", 14x30", Timken, Latest Type
JONES & LAMSON "Flat" 20x22", 24x24 autom., latest
LeBLOND 21"x96" Centers, Geared, Motor Drive
LeBLOND 21"x96" centers, TIMKEN, latest type
LEHMANN 16x30" centers, 16"x30", 14"x30" Timken, Latest
LODGE & SHIPLEY 16"x30", 14"x30" Timken, Latest
LODGE & SHIPLEY 16"x72 centers, M.D.
LODGE & SHIPLEY 18x72 centers, M.D.
LOSWING 4x36, 4x54, 8x60, 8x108, 8x144, Latest
MONARCH 10"x20" centers, Model EE, Timken, latest
MONARCH 12"x30" centers, Model CKK, Timken, lat.
MONARCH 12"x30" Centers, Model CK, Timken, latest
MONARCH 12"x54" Centers, Model CW, Latest
MONARCH 16"x78" Centers, Model CW, Latest
MONARCH 24"x54" Ball Bearing, Geared Head, M.D.
MONARCH 22"x96" Centers, 3 Carriages, Timken Bearing, Model CM, Motor Drive
NILES 20"x50" Boring "Time Saver" Timken, Latest
NILES & WHITNEY 16"x30" Centers, Timken, Latest
PRATT & WHITNEY 10"x20" centers, Bench, latest
PRATT & WHITNEY Motor Drive
PUTNAM 42"x24" Centers, Model A, Latest
REED PRENTICE 20"x54" Centers, Toolroom, Latest
SOUTH BEND 14½"x36" Centers, Timken, latest type
SPRINGFIELD 10"x30" centers, Timken, latest type
WARD, HAGGAS & SMITH—18/30800" centers gap, motor drive, Latest Type

LATHES—Hob and Cutter Relieving
CLEVELAND 12"x16" Centers, Cutter, Motor Drive
MICHIGAN 1712 Universal, Latest Type
U. S. TOOL #816B, 8"x15" Centers, Cutter, Latest

LATHES—Turret
BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
CINCINNATI ACME No. 1 Timken, Latest
FOSTER #48U "Fastermatic" Timken, Latest
GISHOLT #1L, #2L Universal, Timken, Latest Type
GISHOLT #2L, #4 Univ., Timken, Latest Type
JONES & LAMSON #3, #5 Univ., Timken, Latest
LIBBY "International" 1½c Univ., Timken, latest
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
POTTER & JOHNSTON #5U2K, Timken, Latest
WARNER & SWASEY 2, Universal, Timken Bearing
WARNER & SWASEY #2, #3, Timken, Latest type
WARNER & SWASEY 2A Universal, Timken Bearing, Latest Type
WARNER & SWASEY 2A Universal, Timken Bearing, "Pre-selector" Bar and Chucking, Latest Type
Bar and Chucking, Latest Type

MILLING MACHINES—Mfg.
HALL Style L, Planetary, latest type
INGERSOLL 42"x15"x12" adj. rail, 4 heads, AC, M.D.
INGERSOLL 32x24x16" Planer Type, 2 heads, AC, M.D.
INGERSOLL 32x24x12" adj. rail slab, M.D.
INGERSOLL 20x24x12" adj. rail slab, M.D.
SUNDSTRAND Model 2A Duplex 42" feed, Latest
TAYLOR & PENN M30 Duplex Spline, latest

MILLING MACHINES—Plain
BROWN & SHARPE #2, Light Type, Timken, Latest
BROWN & SHARPE #12, 24" feed, Latest
BROWN & SHARPE #999, Timken, Latest Type
BROWN & SHARPE #2B, 3B, Timken, Latest Type
BROWN & SHARPE 2B Automatic, Latest Type
CINCINNATI 6-8, 7-12, 2-18 Automatic, Late Type
CINCINNATI #3, #4, #5 High Power, Late Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
KEARNEY & TRECKER #2H, 3H, 4H, 5H, Latest
KEARNEY & TRECKER 121S, 140I, Simplex, Latest
KEARNEY & TRECKER 121S, 140I, Simplex, Latest
KEARNEY & TRECKER 4K, Timken Bearing, Late
KEMPSMITH #3G, #4, Timken, Latest Type
KEARNEY & TRECKER 4K, Timken Bearing, Late

MILLING MACHINES—Thread
LEES BRADNER Model LT, 6"x36" Centers, Latest
LEES BRADNER Model HT, 12"x54" Centers, Latest
MOREY 12"x30", 60", 120", 180" centers, Latest Type
PRATT & WHITNEY 4½"x12" Model C, Latest Type

MILLING MACHINES—Universal
BROWN & SHARPE No. 2A, Timken Bearing, Latest
BROWN & SHARPE No. 3A, 4A, Motor Drive
BROWN & SHARPE No. 3, Timken, Latest Type
CINCINNATI 52MH, Timken, Latest Type
CINCINNATI & TRECKER 2H, Timken, Latest Type
KEARNEY & TRECKER 2H, 2K, 3H, Timken, Latest
KEMPSMITH #4 Maxi-miller, Timken, latest type
VAN NORMAN #3 duplex, Motor Drive
VAN NORMAN #26, #36, Timken, Latest Type

MILLING MACHINES—Vertical
BROWN & SHARPE #2 Standard Timken, Latest
CINCINNATI #52, Dial Type, High Speed, Latest
CINCINNATI #98, TIMKEN, Latest Type
GORTON 8D, 8½D Super-Speed, Latest Type
KEARNEY & TRECKER 2H, 2K, 3H, Timken, Latest
MOREY 12M Single & Double Spindle Profiler, Latest
REED PRENTICE 3VG, with or without hydraulic duplicator, Timken bearing, Latest Type

PLANERS
BETTS (CONSOLIDATED) 84"x92"x16' 4 heads, Box Table, Rapid Traverse, D.C. M.D. Late Type
BETTS (CONSOLIDATED) 108"x84"x30' 4 heads, Box Table, Rapid Traverse, D.C., M.D. Late Type
CINCINNATI 30"x30"x8' Openside, Motor Drive
CLEVELAND 48"x48"x12' 4 heads, Motor Drive
DETRICK & HARVEY 48"x48"x16' 4 heads, Hydraulic Rapid Traverse, A.C. Motor Drive
NILES 108"x84"x42" 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
NILES 42"x42"x14' "Time Saver." Box Table, 2 Heads, PRT, VARI-VOLTAGE Drive, Latest
NILES 96"x96"x24' 4 heads, Rapid Traverse, Box Table, D.C. reversing motor drive

PRESSES
BIRDSBORO 225 ton, vert. hyd., Latest Type
BLISS 75-35 Hydro Dynamic, Double Action, Latest
GLEASON 12" Quenching, Hyd., Motor Drive
HENRY & WRIGHT 50 ton Vert., Hyd., Latest Type
LAKE ERIE 500 ton Vert., Hyd., Latest Type
NILES 400 ton, Hydraulic wheel, Motor Drive

SCREW MACHINES—Automatic
ACME GRIDLEY 2" Model RAN, 6 spindle, Latest
BROWN & SHARPE 2G, 1" capacity, M.D.
CLEVELAND 9/16", 1-1/16" Model A, Latest Type
CONOMATIC 1⅝", 8 spindle, High Speed, Latest Type
CONOMATIC 1⅝", 6 spindle, high speed, Latest Type, Tool rotating, Latest Type
GOSS & DeLEEUW 6"x6¾", 5 spindle Chucker, Tool rotating, Latest Type
GOSS & DeLEEUW 8" 5 spindle Chucker, Work Rotating, Latest Type

SHAPERS & SLOTTERS
AMERICAN 20" Heavy Duty, Motor Drive
DILL 20"-24" Vertical, Motor Drive
GOULD & EBERHARDT 20", 22", High Duty, M.D.
PRATT & WHITNEY 6" Vertical, M.D.
ROCKFORD 20", Hydraulic Shaper-Planer, Latest

SHEARS—Power
QUICKWORK #2, ¼" Cap., Rotary Shear, M.D.
QUICKWORK #6, ½" Cap., Rotary Shear, M.D.
WYSONG & MILES #572, 14 gauge x 6' Latest Type

MISCELLANEOUS
AJAX 2", 3½" Forging and Upsetting, M.D.
BAKER #5 Kerosene Motor Drive
BARNES #112, 200H, 397, 307H Vertical Hone, Hyd., Self Oiling, Latest Type
CAMPBELL #401 Abrasive Saw, Latest Type
CAMPBELL #401 Contact Clarifier, Latest
DE LAVAL #194 Centrifugal Superfinisher, Latest
FOSTER 4"x16", 4"x36" Superfinisher, Latest
HELLER Model 8S-1 Cold Saw, 6" cap., M.D.
LANDIS 2" Single & Dble. Bolt Threader, M.D.
MANVILLE 2D 7/16" Cap. SSSD, Ball Header, M.D.
NAZEL #4B Pneumatic Hammer, M.D.
NORTON 23F 10U Vertical Lapper, Latest Type
PRATT & WHITNEY (KELLER) Type BL 2416, Type G, Copying 2 and 3 dimensional, Latest Type
ROWBOTTOM Cam Miller, Motor Drive
WATERBURY FARREL #30 Thread Roller, M.D.

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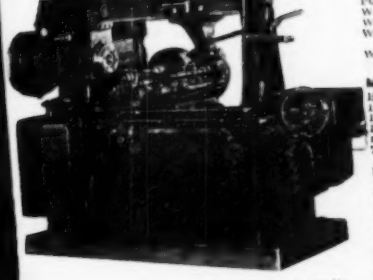
For MODERN high quality machine tools nearly all built new since 1941. These tools are priced well within your equipment budget. Wire, write or phone for pictures, details and prices, today.



BARBER COLMAN Type A Gear Hobber 12" capacity. Latest Type

Most Built After 1941

Available for Prompt Shipment

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

MOREY MACHINERY CO., INC.

FOR MORE VALUE . . . NEW YORK 13, N.Y.

UNUSUAL BUYS WITH GUARANTEED PERFORMANCE

BORING MILLS

Bullard 36" Vert., Spiral Drive
Bullard 36", Vert., New Era Type Head
Lucas 3" bar, #1, Horiz.
Heald #48, Single End Borematic
Heald #47 A, Boring Machine
P & H Horiz. 4" bar
Defiance #25 A Boring—Drilling, 3½" bar
Defiance #6, 4½" bar
Miles 36", Vert., M.D.
King 52", Vert., M.D.

BULLARD 42" LATE TYPE

LATHES

American 14"x5', 3 spd. SCEL.
American 16"x5', 4 spd. bg. SCEL
American 16"x5', Cullman Drive
American 16"x5', 3 spd. dbg. SCEL
American 18"x5', Geared Head
American 18"x5', 3 spd. Bowl Head, BG
American 24"x10', SPD, GH, SCEL
American 24"x12', 8 speed, GH, SCEL
American 24"x12', 12 Speed, M.D.
American 24"x14', 8 speed, GH

AMERICAN 30"x15' GH, 12 SPEED SCEL, M.D.
AMERICAN 30"x28' GH, 12 SPEED, SCEL, M.D.
AMERICAN 42"x14' BED INTERNAL FACE PLATE DRIVE GH ENGINE LATHE, M.D.

Boye & Emmes 16"x5', 4 spd. dbg. SCEL
Boye & Emmes 18"x5', 3 spd. dbg. SCEL
Boye & Emmes 18"x8', 3 spd. Lima Drive
Boye & Emmes 18"x10', M.D., SCEL
Hendy 14"x5', 3 spd. qc. SCEL
Hendy 14"x8', 4 spd. Drive all Drive
Hendy 14"x8', Model 68M, Motor driven
Hendy 16"x8', 4 spd. sbg. SCEL
Hendy 18"x8', 4 spd. SCEL
LeBlond 17"x5', spd. 12 speeds, gh
LeBlond 17"x5', 3 spd. dbg
LeBlond 21"x5', 3 spd. dbg. SCEL
LeBlond 24"x10', 3 spd. SCEL

LEBLOND 25"x12' H.D., QC, SCEL, M.D.

LODGE & SHIPLEY 14"x30" CENTERS, SELECTIVE G.H., M.D.

Lodge & Shipley 14"x5', 5 spd. bg. SCEL
Lodge & Shipley 14"x6', 3 spd. dbg. SCEL
Lodge & Shipley 16"x8', Selective G.H.
Lodge & Shipley 18"x8', spd. SCEL
Lodge & Shipley 18"x8', 3 spd. dbg. SCEL
Lodge & Shipley 18"x8', 3 spd. dbg. SCEL

LODGE & SHIPLEY 20"x8' GH. SCEL, M.D.

Lodge & Shipley 20"x10', 3 spd. SCEL
Lodge & Shipley 24"x10', 3 spd. dbg. Turner Uni Drive
Monarch 14"x5', 3 spd. dbg
Monarch 16"x8', 8 speeds, SCEL

NILES TIMESAVER 30"x10' CENTERS DOUBLE WALL APRON

Sebastian 16"x8', 4 spd. SCEL
Sebastian 20"x8', GH, SCEL
Schumacher & Boye 30"x24', Internal Face Plate Drive
SpringBold 18"x8', 4 spd. SCEL

GEAR CUTTERS

Brown & Sharpe #3—30" Automatic, SPD
Gould & Eberhardt 18H, spd. MD
Gould & Eberhardt 36S, Vert. cutter
Brown & Sharpe #3—20", MD
Fellows #6IS, Helical
Gleason 0" straight Bevel, MD
Gleason 10" Spiral bevel gear Generator

GRINDERS, ALL TYPES

Cincinnati #2 Centerless
Cincinnati #3 Centerless
Brown & Sharpe #13 Univ. & Tool Grinder
Covel #91A Univ. Cutter & Tool Grinder
Sellers #47 Tool Grinder
Landis 12"x72" Plain Self Contained Grinder
Norton 14"x96" Type BA Plain Grinder
Landis 20"x220" centers, Plain Cylindrical Grinder
Landis 10"x72", Plain Self Contained
Brown & Sharpe #2 Plain Grinder
Norton 14"x30" Univ. Grinder
Landis 10"x24" Type "C" Hyd. Univ. Grinder

GRINDERS

CINCINNATI 14"x30", Hydraulic Grinder
Gallmeyer & Livingston #4, Univ. Tool Grinder

PRESS

ONE—500 TON H.P.M. HYDRAULIC PUNCH
PRESS BLANK HOLDER TRAVEL 30" —
RAM TRAVEL 60" — BOLSTER, 48"x48" —
NEW IN 1941

GUARANTEED MACHINERY

Cincinnati Machinery Co., Inc.
219 East Second Street
Cincinnati 2, Ohio

22—No. 12-7A (50 ton)
12—No. 12-9A (80 ton)

ZEH & HAHNEMANN

STRAIGHT SIDE DOUBLE CRANK PRESSES, M.D. with Automatic Lubrication & Roll Feeds.
SOME NEW 1948 LOW PRICES
WIGGLESWORTH MACHINERY COMPANY
203 BENT ST. CAMBRIDGE, MASS.

HORIZONTAL BORING MILLS

533 Lucas, 4½" bar, equipped with heavy OVERHEAD VERTICAL MILLING ATTACHMENT, 36" ROTARY TABLE; extra width, extra height; brand new leadscrews and nuts for the head; 10 hp motor; excellent.

3" bar UNIVERSAL "Tri-Way", standard machine, 1942.

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St. Providence, R. I.

H.P.M. 100-ton Hydraulic Press.
Heald No. 25A—24 Rotary Surface Grinder.
No. 00 B & S High Speed Auto., mag. feed.
National Acme No. 1T Thread Roller.

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT - GUARANTEED
MBMA
JOSEPH **HYMAN** & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

CONSIDER MILES TOOLS FIRST

BORING MACHINES

Nos. 47A, 48A Heald Borematic
No. 49 Heald double end
Nos. 112B & 2112 Excello
Vernon Jig Borer
No. 2 Pratt & Whitney jig borer
5" No. 3A Universal horizontal
3½" No. 32 Lucas horizontal
4½" No. 33 Lucas horizontal
5" Jones planer table type
52" King vertical
100" Niles Bement Pond. vert.
24" Bullard vertical turret lathe
30" Bullard single turret head vert.
36" Bullard spiral drive vertical turret lathe
Natco 1-way horizontal
No. 4 HH Baker 2-way with mult. heads.
Munson double end

DRILLS, UPRIGHT & HEAVY DUTY

20" Barnes box column
20" Cint. Mach. Super Service
20" Colburn No. 2
20" No. B225H Natco
21" Barnes No. 210, 4 spdl.
21" Cassdy Otto, NEW
21" & 24" Cincinnati Bickford
22" No. 121 Baker box column
24" No. 217 Baker 3 spdl.
24" Kokomo, SH, BG, PF, TA
24" No. 25 Foote Burt heavy
24" No. 315 & 310 Baker
28" Aurora sliding head bg.
No. 30 HO Baker 2 spdl. inverted

DRILLS, MULTIPLE & MISC.

8 spdl. No. 11 Natco multiple
12 spdl. No. 39 Natco rail
12 spdl. No. 25 Baush rail
16 spdl. No. 28L Natco multiple
22 spdl. No. 14 Natco multiple
24 spdl. No. B4A Natco multiple
34 spdl. No. 30 Natco multiple
42 spdl. No. B16 Natco multiple
Watson Two way
Type 4HH Baker two way hydr.
Natco one way
Barnes 2 spdl. deep hole
No. 15½ Foote Burt hydraulic
5 spindle Detroit horizontal
13" column Dreses
24" 4-spdl. Allen sensitive
24" 6-spdl. Foote Burt sensitive
24" 4-spdl. Demco sensitive

GEAR MACHINERY

No. 5M Adams Mfg. hobber
Types A & T Barber Colman
Nos. 3 & 12 Barber Colman
No. 72 Fellows gear shaper
No. 8M Fellows gear shaper
No. 6 Fellows gear shaper
No. 130 Cleveland Rigid hobber
No. 18H G & E hobber
Nos. 8H, 12H & 16HS G & E
Nos. 1, & 5A Lees Bradner
24" x 12" Flather automatic spur
Cincinnati Peerless chamferer
2 spdl. Lipe chamferer
3" Gleason spiral bevel gen.
No. 7 Gleason cutter grinder
18" Gleason lappers & testers
8" Red Ring gear lapper
12" Red Ring gear shaver
"MAL" Barnes gear lapper

PRESES

No. 6 Amer. Can OBI
No. 3 Consolidated OBI
No. 19 Watertown OBI
Nos. P1, P2, P3, P4 & P5 Ferracute
No. PG5 Ferracute
No. 32P Toledo punching
No. CA4 Ferracute adj. bed
No. 11 Toledo adj. bed horning
No. 10 Bliss reducing str. side
Nos. 73½, 75½ & 304 Bliss
No. 52 Toledo Arch. Frame
No. 506 Bliss straight side
No. 36 Toledo straight side
No. 267 Hamilton, air clutch
48" No. 280C Toledo double crank straight side
600 ton No. 2316½ Hamilton straight side eccentric shaft
150 ton EG 52 Ferracute coining
600 ton No. 2316½ Hamilton straight side eccentric shaft
1000 ton No. 666 Toledo coining
No. 52 Toledo arch frame
48" No. 93½ Toledo double crank
48" No. 205C Toledo double crank
No. 202B Toledo double crank
150 ton No. F1350-36 Clearing
No. 1½ & 1½C Bliss cam draw
1000 ton Baldwin Southwark hydraulic
20" stroke, 42" x 54" bed, 50" daylight, new 1940
150 & 100 ton HPM hydraulic
75 ton Southwark hydraulic
35 ton Metalwood straightening

MILES MACHINERY CO.
SAGINAW, MICHIGAN

AARON FOR ONE OF THE LARGEST STOCKS OF MODERN MACHINERY AT LOWEST PRICES—MONEY BACK GUARANTEES

AUTOMATICS
Brown & Sharpe #2G 1⅛" cap. (2)
Brown & Sharpe, Nos. 00G, 4 and 6.
Conomatic 8 sp. 1⅞" cap.
CECO ⅝"
Fay Automatic, 12"x81".
New Britain No. 61—2¼" 6 spd.

BORING MILLS
Giddings & Lewis No. 0, No. 25T.
Lucas No. 31, horiz., Heald single & dble. spd.
Universal 3" horiz. equipped.

DRILLS AND RADIALS
Allen, 6 spindle, 7" overhang.
Cinci-Bickford Sup. Ser. 21".
Carlton 8' 19" cel., Canedy-Otto 2' 8" cel.
Sibley 24"-28"
Hamilton, Langelier, Hi-Speed.

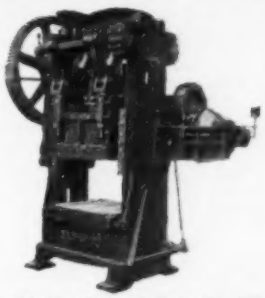
ENGRAVERS
Gorton No. 3U, 2 dimen.
Deckel GK1, 3 dimen.
Gorton Cutter Grinders 375-2, 265-6.

GEAR EQUIPMENT
Barber Colman No. 3 Precision & Pl.
Fellows 72, 725, 645Y, High Speed.
Gleason #2 Surface Hardener.
Gleason #3 Generator
Gleason 3" Spur & Bevel Generator
Hamilton Hobber
Michigan, Gleason, Fellows Checkers.
Mikron Gear Hobber.

GRINDERS, MISCELLANEOUS
Brown & Sharpe No. 5 cyl. 3" x 18".
B. & S. Nos. 1, 2, 3 Univ.
B. & S. No. 13 Univ. & Tool.
Cinc. No. 2 Centerless Filmatic.
Cinn. 12 x 36", 12 x 48" Filmatic Univ.
Covel No. 91A Univ. Tool & Cutter.
Gardner #226, 30" Disc.
Hanchett #228 Disc, Dbl. opposed.
Heald 72A3 Sizematic Int. Centerless.
Jones & Lamson Thread, Univ. TG36
K.O. Lee Tool & Cutter.
Landis Centerless.
Landis No. 4H Cyl. 4x 12", No. 6 Thread.
Norton No. 2 Tool & Cutter, Hyd.
Oliver 510 Drill Grinder. Sellers 4G Drill Grinder

GRINDERS, SURFACE
Abbrasive #5B, 8"x24" cap.
Abrasive No. 33, 34 Vert., 8 x 24
Blanchard No. 11, 16" Mag. Chuck.
Brown & Sharpe No. 5, 8x24" Hydr.
G. & L. No. 25, 35 Hyd., 6 x 18", 8 x 24".
Hanchett Model 309, 13 x 48".
Norton 6 x 18". Hyd.
Reid No. 2A P.F. MIB.
Reid No. 2C Pope Spdl. Hand Feed.
Thompson Hyd. 6 x 18 x 18", 6 x 12 x 18".

LATHES
Bradford 14"x6', G.H. Latest Sebastion 12"x4'
Hardinge Precision, 1" Collet Cap., Rivett. Precision.
Hendey G.H. 16x30". Rel. Att.



Bliss Double Crank Toggle Press No. 406— 48"

Bliss No. 304A, 305A, 306 Straight Side Presses.
Bliss #8—Bed 42x96"—250 Ton.
Bliss 645B, 650, 675 High Production Presses
Henry & Wright 75, 25 Ton Dieing Presses

HYDRAULIC PRESSES

DOWN MOVING RAM, SELF CONTAINED

MANUFACTURER	TON CAP.	STR.	OPENING	PLATEN
Lake Erie	500	36"	68½	35 x 36
Baldwin Southwark	400	32"	36"	76 x 59
H.P.M. Double Action	500	24"	30"	36 x 36
Watson Stillman Shaft Straightener	500	24"	57"	24' bed.
Denison	25/50	18"	23"	22 x 20
Hannifin	50	20"	30"	22 x 30
Southwark, D. A. Clamping Plate	150	30"	2' to 4'	84 x 30
Oilgear Shaft Straightener	35	8"	12"	84 x 11

DOWN MOVING RAM, WITHOUT POWER UNIT

Mesta	750	42"	80"	44 x 44
Chambersburg	300	10"	27"	22 x 36
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	68½"	42 x 32

UP MOVING RAM PRESSES

Waterbury Farrel	1000	7"	55½"	30 x 28
Waterbury Farrel	800	6½"	28"	22 x 24
Waterbury Farrel (3 Rod)	500	4"	28¼"	28" Bet. Rods
Watson Stillman	300	12"	21"	24 x 20
Watson Stillman	300	12"	19"	20 x 20
Watson Stillman (Hub) New and Used	300	4"	22"	16 x 16
HPM	180	15"	14½"	30 x 30
Dunning & Boschert Molding Press	300	12"	38"	24 x 32 Mold
Stokes Molding Press and Pump	100	7"	34"	22 x 15
Stokes Molding Press and Pump	150	8"	31"	24 x 23
Elmes—With Elec. Plates	50	4"	12"	18 x 18
Stewart Bolling	85	10"	19"	20 x 20

WHEEL PRESSES

NILES—400 ton 96"; 500 ton—48"; 300 ton—48".

INJECTION MOLDERS

ACCUMULATORS

	Size	Pounds
Mfr.		
HPM	6" x 9'	2000
General Electric	15" x 11'	400
Watson Stillman (13 gal) Hydr. Pneu.	42 x 9 x 48"	3000

LeBlond Regal 10"x3½', 15"x30", 16"x40" TA, 19"x48" TA, 21"x 60"
LeBlond Heavy duty 16"x30".
Lodge & Shipley 16 x 72" T.A., Collets, etc.

Monarch 10"x 20" EE, 16 x 78 G.H. 12x30"
South Bend Q.C.G., 13"x6', 16"x4', 14½"x6'

MILLS, PRODUCTION
Brown & Sharpe, No. 000, 12, 21.
Cincinnati No. 1-12, 1-18, 2-18 Mfg.
U. S. Multimiller, 1 and 2 Spindles.
Sundstrand 09 Rigidmills, Nichols, Kent Owens IV.

MILLS, PLAIN AND UNIVERSAL
B. & S. No. 2B Plain
B. & S. No. 2A Univ.
Cincinnati No. 3 Plain
Cincinnati No. 2MH Univ., H.S.
Milwaukee 2HL, 2H Univ., H.S.
Milwaukee No. 2H Plain.
Van Norman Duplex, 12, 20, 22L, 36.

MILLS, VERTICAL
Bridgeport, Index, Jackson
Brown & Sharpe No. 2 Standard.
Cincinnati No. 4, Hi-Power.
Gorton No. 8D, 9J Plain, 8½D Duplicator.
Morey No. 12M Profiler 2 sp.
Sipp MP8 Jig Borer.

PRESSES
Bliss No. 304A, 4" Str. 23"x24"
Bliss No. 305A, 4" Str. 30" x 30"
Bliss No. 645B, 650, 675 Hi-Production, 58, 62, 62A, 162.
Bliss No. 8 42"x96", 250 Ton
Bliss No. 4½ Double Action Cam
Henry & Wright Dieing, 25 Ton, 75 Ton.
L & J #2, 3, 4, O.B.I.
Reliance 45 Ton, O.B.I.
Gen. Screw Press.
Z. & H. 80 Ton, O.B.I.
Stokes Tablet Presses, Model R & T.

TURRET LATHES
Acme No. 4W, 6W Bar and Chuck, Acme Fox.
Bardons & Oliver No. 3, 1¼" cap., No. 5, Chuck.
Brown & Sharpe No. 1, 2F, Foster No. 3B.
Gisholt No. 4, 5 Bar and Chuck, IL.
J. & L. No. 8A, Well Tooled, Excellent, Saddle type.
Warner & Swasey No. 3, 4, 5, Preselector, No. 4A 8" Cap.

MISCELLANEOUS
Band Saw: Doall V16 Contour, ML., Tannewitz No. 36M.
Bending Roll: Buffalo No. 0, Excelsior 14, Buffalo Wrapping Roll No. ⅛.
Broach, American Horiz. Hyd. H-15-60.
Hacksaw: Marvel Nos. 6 and 6A Automatic Feed.
Notching Press: Ferracute C82.
Pin Machine: Nilson.
Shaper: Sheldon 12" Brand New 24" Rockford Hyd. Heavy Duty.
Shaper—P&W 6" Vertical.
Honer: Micromatic Hydrohoner, Sunnen.
Keyseaters: Mitts & Merrill, Baker, Burr, Davis
Rivet Hammers: Hi Speed, Chic. Pneumatic.
Toolmakers Microscope: Gaertner, Bausch & Lomb, Leitz
Router: Onsrud W240, #55 Oliver.
Tapper: Bakewell #1, Haskins 3C, 2C.
Welders—Spot & Seam: Thompson, Taylor, Winfield.

WRITE FOR FREE CATALOG

AARON MACHINERY CO., Inc.

45 Crosby Street, New York 12, N. Y.
WOrth 4-8233 Cable: AARMACH, N. Y.

MONA MEMBER

SEARCHLIGHT SECTION

LATE TYPE MACHINE TOOLS

AUTOMATICS
6" RAP-8 Acme-Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 spdl. 1941.
3½" Cleveland Model A. 1943.
2½" Cleveland Model A. 1943.
2⅝" RA-8 Acme-Gridley. 1943.
1⅝" Greenlee, 6 spindle. 1942.
9/16" RA-6 Acme-Gridley. 1942.

BORING MACHINES
No. 42 Lucas Horizontal. 1940.
No. 54 Excello Double End. 1940.
No. 46B Heald Single End. 1940.

DRILLS
3' 9" Morris "Mor-Speed". Latest.
No. 415 Defiance, box column. 1944.
No. 217 Baker, box column. 1942.
No. 5 BM Fosdick, box column. 1942.

GEAR EQUIPMENT
3" Gleason Generator. 1941.
No. 6 & 17 Gleason Testers. 1943.
12" Red Ring Internal Shaver. Late.
No. GCL Red Ring Shaver. 1942
No. 624A3 Fellows Side Trimmer. New.
No. 645A3, 615A & 61A Fellows. 1944.
No. 7125A & 712 Fellows Shaper. 1943.
Vinco Spline & Gear Grinder. 1942.

GRINDERS, CYLINDRICAL
25"x48" Landis, Crankshaft. Like New.
16"x36" Cincinnati Plain. 1942.
12"x48" Cincinnati Univ. 1943.
10"x72" Landis Plain. 1942.
10"x18" Norton Plain. 1942.

GRINDERS, INTERNAL
No. 74 Heald Ext. Bridge. 1941.
No. 72A3 & A5 Heald Plain. 1944.
No. 5 & 16A22 Bryant. Latest.

GRINDERS, SURFACE
12"x16"x60" Thompson Hyd. Latest.
No. 22 & 25A Heald Rotary. 1943.

LATHES, ENGINE
45"x192" Axelson. 1942.
24"x168" Sidney. 1942.
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.

LATHES, PRODUCTION
Gisholt "Simplimatic". 1940.
No. 3A L&S "Duomatic". 1943.
No. 2FU Foster "Fastermatic". 1943.
8"x108" Lo-Swing Semi. Auto. 1942.
Model 8, 10 & 12 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic". 1941.

LATHES, TURRET
42"x36" Bullard Vertical. 1943.
No. 1A, 2A & 3A Warner & Swasey. 1943.
No. 1 & 8½"x24" Acme Univ. 1943.
No. 2, 3 & 4 Warner & Swasey. 1943.
No. 3, 5 & 7 Bardons & Oliver. 1942.

MILLS, PLAIN
No. 5 Cincinnati. 1943.
No. 4H & 4K Milwaukee. 1943.
No. 3 Van Norman. 1942.
No. 2HL Milwaukee. 1942.

MILLS, PRODUCTION
No. 1-14 & 2-20 Kent Owens. 1942.
M-18 Kearney & Trecker. 1943.
No. 1224 Kearney & Trecker. 1942.
No. 3-36 Cincinnati Duplex, R & F. 1942.
No. 1-18, 2-18 & 2-24 Cincinnati. 1942.

MILLS, THREAD
6"x60" Pratt & Whitney. Latest.
12"x54" Lees Bradner. 1943.
6"x36" Lees Bradner. 1942.

MILLS, UNIVERSAL
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No. 26U & 26SU Van Norman. 1942.

MILLS, VERTICAL
No. 3B P&W Univ. Die Sinker. 1943.
No. 2K & 3H Milwaukee. 1942.
No. 2 & 3 Cincinnati. 1942.
No. 1 Cleveland. 1942.

PRESSES
No. 40—51½ Minster. 1942.
100 Ton Hannifin, Hyd. Str. 1942.
50 Ton Denison, Hyd. Str. 1942.

INDIANAPOLIS MACHINERY & SUPPLY CO.
1961 S. Meridian St.
INDIANAPOLIS 6, IND.

PERFORMANCE TESTED *Machine Tools*

LATHES

Lodge & Shipley 14"x6' and 8', 12 spd. sel. gr. hd. 33½" and 58" C.D. Attachments. Motor in base.

Monarch 20"x72" centers model "M", 16 spd. gr. hd. 22½" swing, Monarch automatic sizing control (late).

Lodge & Shipley 24"x12', 12 spd. sel. gr. hd. 27½" swing, 76" C.D.

Lebland 33"—60" Sliding Gap lathe, 9'2" C.D. Gap closed, 14'2" C.D. gap extended.

RADIAL DRILLS

American 4'12" triple purpose M.D. #4 taper and 4'11" American 24 speed 7½ HP motor-on-arm, triple purpose.

Fosdick 5'17" and 5'15" motor on arm "Economax" Hydr. #6 taper (very late).

BORING MILLS

Universal 4" bar "Tri-way", face plate to outer support 72", #6 taper, added vertical range (late).

Defiance 25A, 3¼" bar, face plate to outer support 72", #6 taper, added vertical and cross range (late).

Yoder #3A, 3" bar, face plate to outer support, #5 taper (late).

Lucas #33, 4½" bar, face plate to outer support 84", #6 Morse taper, A.C. motor drive.

Fisher 5" floor type, vert. travel hd. 60", hor. travel col. 110", platen (very late).

TURRET LATHES

Warner & Swasey #3, 1½" cap., #4 2" cap. ram type Universal bar and chucking, tooling.

Jones & Lamson #5, 2½" cap. ram type Universal, bar and chucking.

Warner & Swasey #2A, 2½" cap., #3A, 4½" cap., saddle type, Universal rpd. trav. full length lead screw, bar and chucking.

Jones & Lamson #7A, 2½", #8A, 3", #7D, 2½", saddle type Universal, rpd. Trav., bar and chucking, tooling.

GRINDERS

Brown & Sharpe #2, 14"x30", #4, 14"x60", Universal tooling & attchmts. (very late).

Farrel 30"x182" M.D. roll grinder, max. face ground 182", min. dia. ground 9".

MISCELLANEOUS

(New) Rafter All Steel Power Squaring Shears, available in two sizes: ¼"x10' mild steel, ⅛"x10' stainless steel; 3/16"x12' mild steel, 3/32"x12' stainless steel, stock delivery.

This Is Only a Partial Listing.
Send for Our Catalog.

Botwinik Brothers
Machinery Inc.

Metal Forming and Bending Machine
12 Sp. Moline Drilling Mach.
36" Automatic Indexing Table
#6-D Potter & Johnson Turret Lathe
Reid "SmallPiece" Mfg. Lathe
3 Spindle Moline Model 7-D Cylinder Borer
1-A W&S Universal Turret Lathe
30"x14' Schumacher & Boye Engine Lathe
Libby 26"x4½" Spindle Turret Lathe
20" Steckbridge Shaper
Lees-Bradner CT 36" Thread Millers 1942
Crankshaft Grinder
Foote-Burt 4 Spindle Drill #2 M.T.
24"—H.S. Milling Cutters (New)

CONTINENTAL SALVAGE & MACHINERY CORPORATION
1836 EUCLID AVENUE, CLEVELAND 15, OHIO
MAIN 4402

No. 25T G. & L., 2½" table Hor. Mill, 1942
4" Univ. Table Mill, 60" vert. 96" hor., '43
36" & 42" King Side Hd. Vert. Mills.
Nos. 1A & 3 W. & S. Turrets, bar & chuck
Nos. 3 & 2MH Cinci. Pl. Dial Millers, late
Nos. 3K & 3H K. & T. Pl. Dial Millers, late
No. 36 Van Norman Pl. Miller, ram, '43
No. 2G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicators, late
No. 9J Gorton Duplicator & Vert. Miller (2)
12"x24" G. & L. No. 45 Surface Grinder, '42
No. 70A Heald Internal Grinder, 1942
Gear Cutter, No. 13 B. & S., spur & bevel
30"x28' cen. Axelson Lathe, T.A.
30"x120" Hanchett Plano Surface Grinder
3" Univ. Table Mill, 40" vert., 72" hor., '43
36" Bullard Spirai, 3 motor Hi-speed
No. 2 Stand. K. & T. Univ. Miller, Timken
Gear Gen., No. 61A Fellows, 1943
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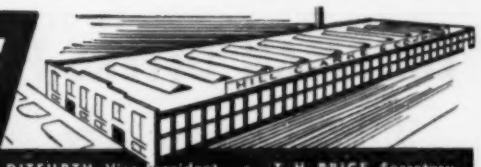

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No. D8 Colburn, No. 6 Morse Taper
No. 200—26" Defiance #5 Taper (1943)
No. 1-LMS Leland-Giffords (1942)
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No. 4-BM Fosdick 4 Spdl. (1942)
No. 6-BM Fosdick 6 Spdl. (1942)
No. 4BL Natco 36 Spdl. (1943)
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No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
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72" Cincinnati Gear Cutter

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No. 2 Lambert 4" bar
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42" Bullard (1944)
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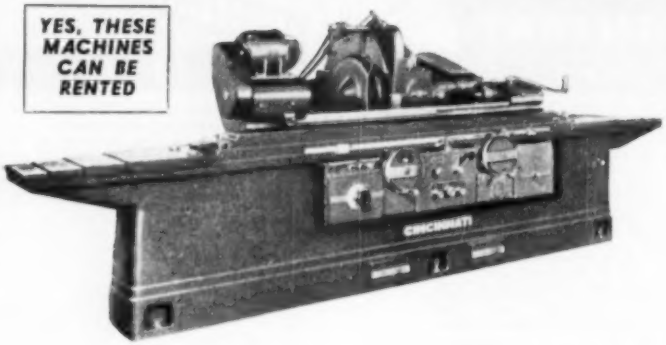

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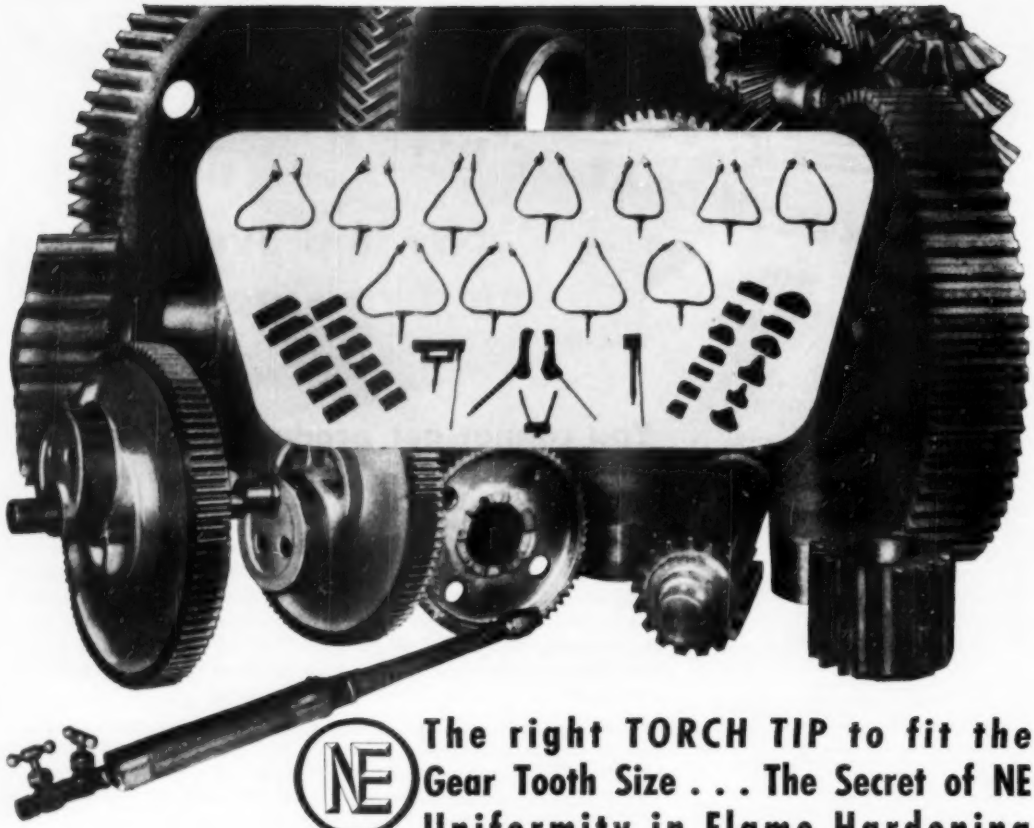

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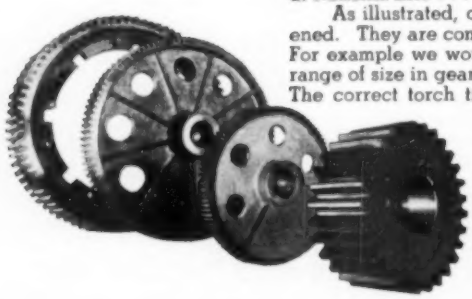

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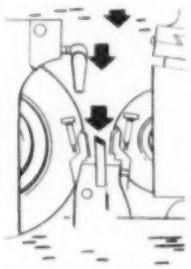
1,000,000 PIECES per grind

1,000,000 pieces per grind! This long service life means continuous operation, less scrap, less down time, lower unit cost. On most applications, **Talide Tungsten Carbide Blades stay on the job 50 to 75 times longer than other blades.**

Remember, the Talide Carbide insert is a solid strip without sections or lines or seams to score the work.

Not only do we manufacture standard blades, we design and make form or step blades for use in grinding parts with multiple diameters, steps, tapers, contours, or other special shapes.



Learn now about longer service life of Talide Centerless Blades. Twenty-four hour delivery from warehouses in Newark, Youngstown, Detroit and Chicago. Write for Catalog 48WP complete with prices, sizes, specifications. Forward part or drawing for estimate.

SINTERED CARBIDES
METAL CARBIDES CORPORATION
TALIDE
YOUNGSTOWN, OHIO
HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

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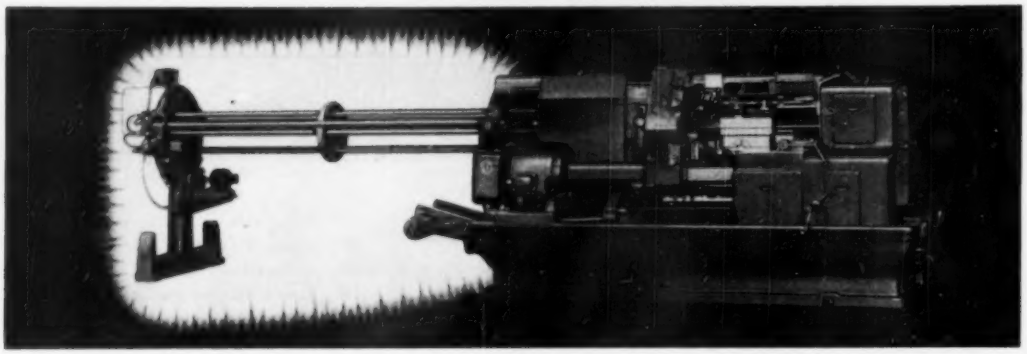
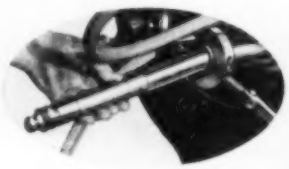
FEED OUT ANY LENGTH TO 16½" WITHOUT PUSHER MARKS!



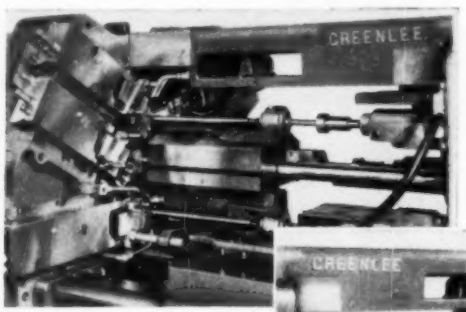
with GREENLEE AIR-FEED AUTOMATICS

Stock scoring — a necessary evil with conventional feed fingers — has often prevented certain jobs and materials from being handled on automatics, and has resulted in higher production costs. Now stock scoring can be completely eliminated by using Greenlee 1-inch 6-Spindle AIR-FEED Automatics which do away with the usual mechanical stock pusher arrangement. Instead of being gripped, the stock is moved forward smoothly and rapidly by an air-propelled piston in each stock reel tube.

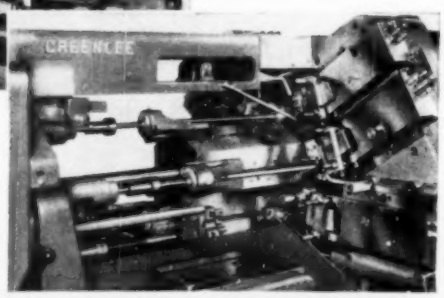
There are other advantages, too. Quicker setups are possible by the elimination of stock pusher changes for different size stock. Multiple feed-out arrangements can be easily adapted, requiring only the setting of stock stops and collet openers at the desired feed-out positions. With only the air behind it, the stock will feed out in *any* of five positions to wherever the stop is set. On simple cut-off and form jobs, this permits production of 2 or 3 pieces per cycle. Investigate Greenlee AIR-FEED for *your* shop.



Showing the piston inserted in the stock reel tube, to push the stock by air pressure. A suction pump returns the piston for reloading the tube.



Left, stations 1, 2, and 3 of a machine set up for multiple feed-out. The piece in this case is 16-3/32" long and requires only forming to a smaller diameter at one end. Live bushings ahead of the stops are used to prevent whipping.



Right, rear view of the same machine as above, showing positions 4, 5, and 6. The stock feeds out at positions 1, 3, and 5 and is formed. Cut-offs are at positions 2, 4, and 6 and chutes (not shown) are rigged to slide finished pieces away from the working area.

PRODUCTION MACHINERY

GREENLEE

GREENLEE BROS. & CO.
1723 Mason Ave., ROCKFORD, ILL.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING-MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

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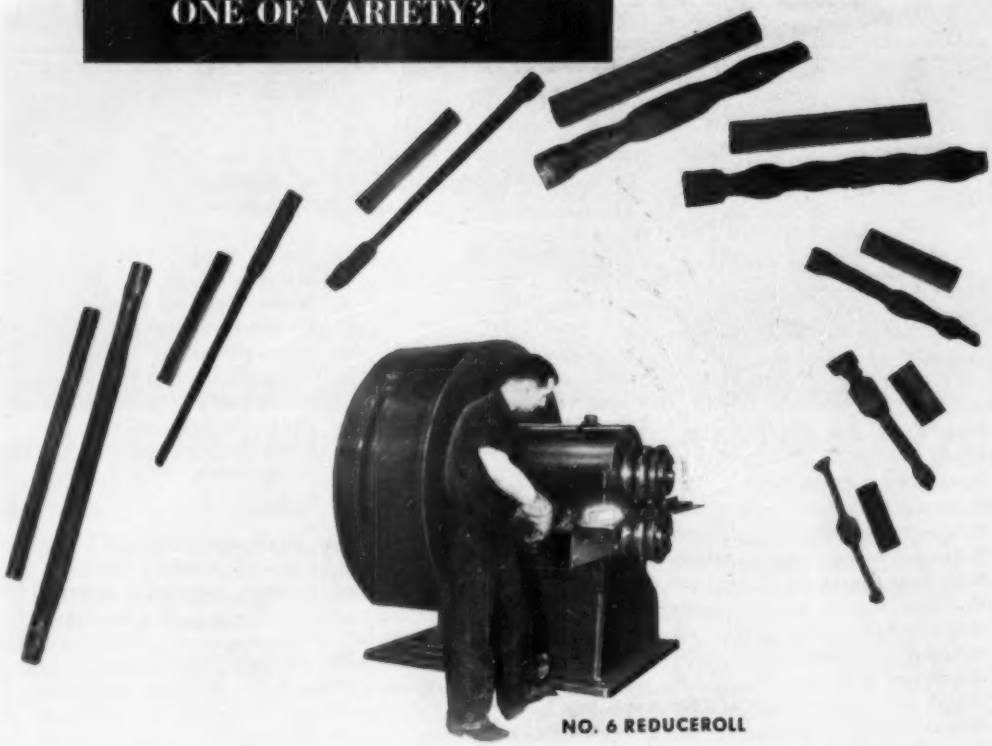
IS YOUR FORGING PROBLEM ONE OF VARIETY?



NO. 6 REDUCEROLL

Above are several forging blanks in a variety of lengths, sizes and shapes which illustrate the versatility of REDUCE-ROLLING. All these forging blanks were pre-formed on a No. 6 REDUCEROLL!

REDUCEROLLING permits an unskilled operator to produce uniform pre-formed blanks. It also increases the productivity of costly forging equipment.

It utilizes simple and inexpensive roll dies which are quickly interchangeable from job to job.

It minimizes flash, thus increasing die life and reducing the wear and tear on finish forging equipment.

Send us prints or samples of the parts you wish to forge, and let us investigate the application of REDUCEROLLING to them. No obligation, of course.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

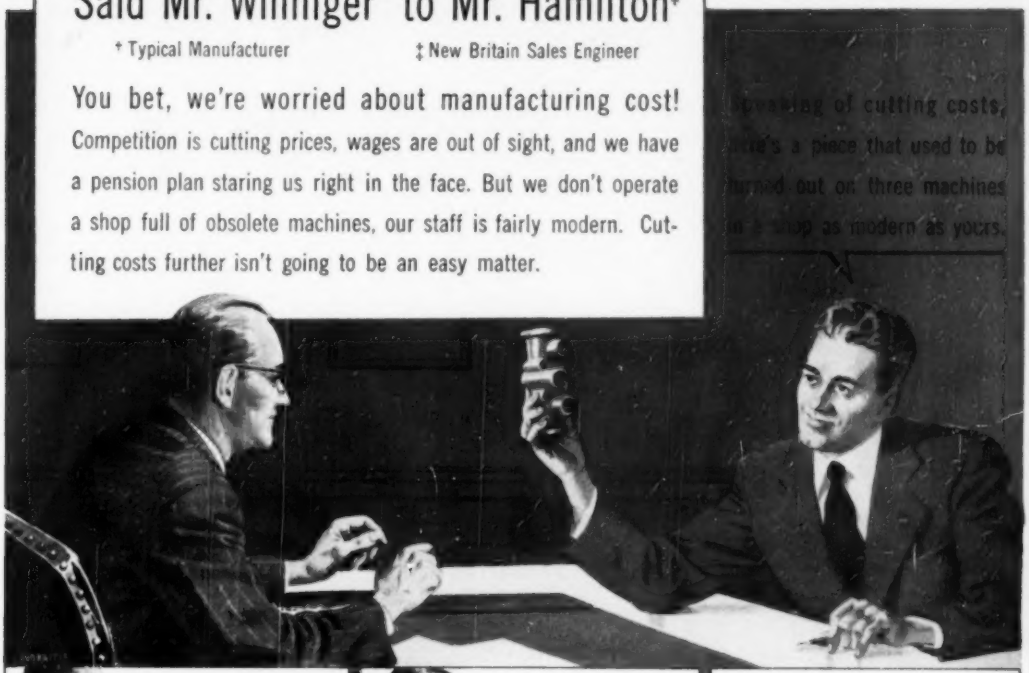
DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

Said Mr. Winniger† to Mr. Hamilton‡

† Typical Manufacturer ‡ New Britain Sales Engineer

You bet, we're worried about manufacturing cost! Competition is cutting prices, wages are out of sight, and we have a pension plan staring us right in the face. But we don't operate a shop full of obsolete machines, our staff is fairly modern. Cutting costs further isn't going to be an easy matter.



You sold a New Britain to replace the other machines?

Yes, it's a job that involves boring thru a seven inch piece. The other machine didn't have enough throw on the tool slide to bore thru, so the piece had to be re-chucked in a second operation. We go right thru in the one setting. Work of this type is handled on our standard machine eliminating special expensive holders and tooling.

Of course that saved a lot of handling and idle time.

It saved a whole machine and increased production besides. We also finish ream in the sixth position which eliminates a third boring operation leaving only a honing operation to bring the bore to within .0003 tolerance and surface finish.

A job like that interests me particularly — because it isn't some tricky special piece, but the sort of work you might find in any shop. When you can find a way to make a big cost reduction on this sort of part, you have something worth talking about. Have you got one of your New Britain Cost History sheets that gives all the dope on it?

We'll send it to you in a few days. Meanwhile, perhaps you'd like to have me do some checking on pieces you're turning out now, or getting ready to make.

Want to help me with my worrying, eh? Okay, I'll just take you up on that—Wait'll I phone Joe, and have him take you thru the shop.

NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY

NEW BRITAIN-GRIDLEY MACHINE DIVISION

NEW BRITAIN, CONNECTICUT

New TIMKEN® "Double-Zero" bearing has twice the accuracy of any TIMKEN bearing ever made!

PRODUCTION BEING INCREASED TO MEET GROWING DEMAND AS "00" BEARING BRINGS NEW PRECISION TO MORE AND MORE PRODUCTS

Twice as accurate as the Timken® "Zero" bearing—previously the most accurate Timken bearing on the market—the new "Double-Zero" bearing offers industry great new opportunities for high precision. Run-out tolerance in the new "Double-Zero" is only 75 millionths of an inch!

This amazingly low run-out has resulted in quick adoption of the "Double-Zero" bearing for lathe spindles, grinding-machine spindles, small precision rolling mills, dividing heads, and gear cutting machines. And production of the "Double-Zero" has been repeatedly upped to meet the growing demand for greater precision.

The extremely high accuracy of the "Double-Zero" bearing has been made possible by The Timken Roller Bearing Company's development of new measuring devices, specialized machine tools, and improved manufacturing methods.

"Double-Zero" sizes and types are shown in the chart below. For more information write The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

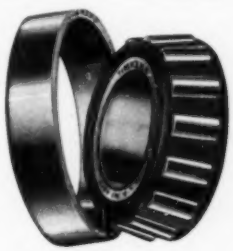
This symbol on a product means its bearings are the best.

A PRECISION TIMKEN BEARING FOR EVERY REQUIREMENT			
CLASS	**"00" (DOUBLE-ZERO)**	**"0" (ZERO)**	**"3" (THREE)**
RUN-OUT	.000075"	.000150"	.000300"
TYPES AVAILABLE	Standard Single Row	Standard Single Row	All types
SIZE RANGE	Up to 10" O.D.	Up to 12" O.D.	Up to 12" O.D.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION ✳